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SUPPLEMENT TO A REPORT BY THE

Comptroller General

OF THE UNITED STATES

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The Federal National Mortgage Association In A Changing Economic Environment

To aid in preparing its April 15, 1985, report The Federal National Mortgage Association in a Changing Economic Environment (GAO/RCED-85-102), GAO convened a group of experts in a one-day symposium to discuss the interest rate and credit risks that the Federal National Mortgage Association (FNMA) is incurring, FNMA's contributions to moderating housing cycles, and FNMA's role in serving low- and moderate-income families. This volume presents the papers given and views expressed at the symposium, including FNMA's. GAO is publishing this volume for the use of congressional and executive branch decision makers and scholars involved in FNMA activities.

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON D.C. 20548

B-199765

The Honorable Jake Garn, Chairman, and
The Honorable William Proxmire,
Ranking Minority Member
Committee on Banking, Housing,
and Urban Affairs
United States Senate

The Honorable Donald W. Riegle, Jr.
United States Senate

The Honorable Henry B. Gonzalez
House of Representatives

The Honorable Stewart B. McKinney
House of Representatives

On April 15, 1985, we issued a report to you entitled The Federal National Mortgage Association in a Changing Economic Environment (GAO/RCED-85-102). The report focused on the Federal National Mortgage Association's (FNMA) role in a changing secondary mortgage market, the interest rate and credit risks that it incurs, the privileges and constraints that affect FNMA in its public-purpose role and its profitability as a shareholder-owned corporation, economic and social benefits resulting from FNMA activities, and Department of Housing and Urban Development and the Department of the Treasury oversight of FNMA activities.

To aid us in preparing our April 15 report, we convened a group of housing experts in a one-day symposium to discuss the interest rate and credit risks that FNMA is incurring, FNMA's contributions to moderating housing cycles, and FNMA's role in serving low- and moderate-income families. This supplement to our report presents the papers given and views expressed at the symposium, including FNMA's. We are publishing this volume for the use of congressional and executive branch decision makers and scholars involved in FNMA activities.

In preparing this volume we retyped the manuscripts and redrew the authors' graphics. With the exception of correcting obvious typographical errors and making minor stylistic changes, we did not otherwise edit the papers.

B-199765

We are sending copies of this report today to several committees and Members of Congress, the Secretary of Housing and Urban Development, FNMA's Chairman of the Board, and other interested parties.

for Charles A. Bowsher
Comptroller General
of the United States

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Summary Of Symposium Proceedings

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This paper summarizes a conference on the Federal National Mortgage Association (FNMA), conducted on February 7, 1985, by the General Accounting Office as part of its study of FNMA. The study was undertaken at the request of the chairman and ranking minority member of the Senate Committee on Banking, Housing, and Urban Affairs; Congressmen Gonzalez and McKinney; and Senator Riegle. The concerns expressed by these members of Congress were quite broad: the current financial operations and future financial environment faced by FNMA and also its capacity to facilitate mortgage lending in the United States and to support the nation's need for affordable housing.

The conference consisted of four papers, formal comments on each paper, and general discussion. It was moderated by Dr. Anthony Downs of the Brookings Institution. The papers covered the following subjects: the countercyclical role of FNMA, by Professor Herbert Kaufman of Arizona State University; the effect of adjustable rate mortgages (ARM) on the profitability of FNMA, by Professor Kerry Vandell of Southern Methodist University; the current and prospective financial situation of FNMA, by Professor James Clarke of Villanova University; and FNMA's role in providing assistance to low- and moderate-income households, by Professor Richard Clemmer of Central Michigan University. Discussants were, in the same order: George von Furstenberg of Indiana University; Donald Cunningham of Baylor University; Edward Kane of Ohio State University; and Irving Margulies of Witkowski, Wiener, McCaffery, and Brodsky, P.C., and Cushing Dolbeare, formerly of the National Low Income Housing Coalition (both discussing Prof. Clemmer's paper). The papers and the formal comments are published elsewhere in this volume. The present paper summarizes them insofar as seems necessary in order to provide the context for the general discussion that they provoked.

As part of each conference session, a specified period of time--equivalent to the time allocated to each discussant--was set aside for comments for representatives of FNMA to discuss the papers and the formal comments. These comments are included in the present paper, in the relevant subsections; a summary also appears separately at the end of this volume.

The subjects covered at the conference can usefully be grouped into two categories:

(1) What are the public purposes of FNMA?

(2) What is its current and probable future financial position?

Discussion of these subjects included both objective statements about the facts of the particular issue, and policy implications deduced from those statements.

PUBLIC PURPOSES OF FNMA

The papers by Profs. Kaufman and Clemmer specifically addressed two of the stated public purposes of FNMA: the mitigation of housing and mortgage credit cycles, and the provision of mortgage credit to lower income households. A third purpose was frequently mentioned during the conference by many speakers: increasing the supply of credit to mortgage and housing markets. Each of these three topics will be addressed in a separate subsection of this paper. Several other purposes were also touched on more briefly during the discussion, and will be noted at the end of this section.

Increasing the Supply of Mortgage Credit

The extent to which FNMA is able to channel resources toward housing and mortgage markets, and away from other sectors of the economy, and the consequences of its actions, received extensive discussion in the course of the conference. This issue was not the topic of a specific paper, but was raised by Prof. Kaufman in the course of presenting the first paper at the conference; was addressed by several participants, formal discussants, and the representatives of FNMA; and was one of the main topics of the concluding summary discussion of the conference. Because of the pervasive interest in this question, it is the first public purpose discussed in the paper.

Benefits to Housing. Timothy Howard of FNMA stated this purpose most succinctly: "I believe that Congress chartered FNMA to channel more funds into housing, to provide more housing than would have been attainable without FNMA, because it wanted more housing." FNMA accomplishes this public purpose by buying mortgages and selling debt to people who would not otherwise have bought mortgages, such as bank portfolio managers, who are barred by regulations from buying mortgages but who can and do buy FNMA debentures. "We will take a mortgage and turn it into something that is not a mortgage." FNMA thus drives mortgage rates down and reduces the interest rate differential between mortgages and other debt instruments. Mortgage rates would remain lower on a permanent basis as a result, because of FNMA's ability to tap sources of funds not available to the mortgage market directly.

Irving Margulies supported this argument: "FNMA is a tremendous allocator of credit, the second largest in the United States, next only to the Treasury." He termed himself "an unreconstructed houser," who should "rejoice at the fact that housing will be given a leg up by the transfer of this money."

Howard and several industry representatives claimed that FNMA's existence causes primary mortgage lenders to make more loans than they otherwise would, because they know they can sell the loan to FNMA, if they need liquidity. Glen Corso of the Mortgage Bankers Association said that the single greatest advantage of FNMA to his members was the fact that FNMA is the single largest purchaser of whole mortgages, and aids in matching capital to

mortgage needs, since otherwise capital is sometimes not available where needs are greatest.

Joseph Hu of Salomon Brothers felt that FNMA's entry into the mortgage-backed security (MBS) field had strengthened the market for that type of security, and helped issuers to become more liquid.

Herbert Kaufman agreed that FNMA had helped the MBS marketplace, but thought this was not particularly beneficial to housing. He cited a FNMA report that the major buyers of MBS are traditional mortgage lenders, who are substituting MBS for whole mortgages in large part. The innovations in MBS that might actually attract new funds are being made by private issuers and the Government National Mortgage Association (GNMA). He also pointed out that GNMA and the Federal Home Loan Mortgage Corporation (Freddy Mac) were already in the MBS field before FNMA entered it.

Howard took issue with the statement that MBS issued by FNMA did not attract funds into housing. He felt that FNMA's portfolio operations probably did so to a greater extent than do MBS, and that although buyers of MBS are also mortgage buyers, they buy MBS because the security is more liquid and tradable than a whole loan or a participation certificate. He also believed that MBS added to liquidity in the mortgage market.

Warren Matthews of the Mortgage Bankers Association argued that FNMA and other federally sponsored credit agencies had helped to create standardized instruments, such as MBS and collateralized mortgage obligations, that in turn helped the housing market become more fully integrated into the national capital markets. He was willing to acknowledge that in 10, 20, or 30 years, there might be less need for FNMA than there was when it was established, but that there was still a need for it now.

Social Costs. Several of the economists at the conference who are affiliated with universities agreed that FNMA does allocate funds to housing, but felt that this imposed costs on the rest of the economy and the society. George von Furstenberg felt that FNMA's growth was "excessive and worrisome" because it helps to keep the housing stock and land values too high, and the stock of business capital too low; the economy is less productive as a consequence. The larger stock of housing does not contribute to more housing production, except for replacement, and the subsidy to housing gets capitalized into "bloated" land values. The poor do not benefit from these policies, because their housing expenditures are not subsidized by the existing tax system to the same extent as those in high tax brackets. As housing is "shoved into a gilt-edged category," other economic activities that have no more risk or no less social value must pay a higher price, and are pushed farther back into the "credit queue." Ultimately, FNMA transfers resources from third parties, who are unwitting parties. The cost is widely diffused, so "there are few businessmen who come in and complain that FNMA is doing us dirt."

Edward Kane asserted that mortgage markets are now working very well--unlike the situation when FNMA was established--and therefore, there was no need to continue the subsidy to housing that FNMA provides.

Kaufman also argued that FNMA's ability to tap nontraditional mortgage lenders for its mortgage market activities results in reallocation away from potentially more productive sectors of the economy. But he felt that reallocation could not occur to any significant extent over a relatively short period of time; FNMA could benefit the mortgage market cyclically but not secularly. (The cyclical argument is discussed in the next subsection.) FNMA also imposes costs on society in other ways; it exposes the government to explicit risk because of its line of credit with the Treasury, and implicit and potentially much greater risk because there is a moral obligation from the government to holders of FNMA debt. FNMA's efforts to reduce the risk also reduce its effectiveness in stimulating housing.

Howard "freely acknowledged" that FNMA's activities result in more housing and less of something else--"and whatever the something else is that you get less of, those people wind up bearing the cost of (FNMA's) existence." He added that homebuyers compete with these other borrowers. Given this decision, FNMA is one of the most effective ways of encouraging housing, in that there is relatively little explicit government cost or transaction cost in getting the benefits to the homebuyer.

Howard also claimed that there was an inconsistency in Kaufman's analysis. FNMA's activities reduce resources available to the private sector, but do not increase them for housing. Kaufman said the point was well taken, insofar as the argument was stated in his paper. He restated it to say that FNMA does preempt a certain amount of interest-sensitive private credit, and its activities result in a less efficient allocation of resources.

Kerry Vandell offered the only demurral to the general consensus that FNMA stimulates the mortgage and housing markets. He felt that it was necessary for further research to value explicitly the federal guarantee and to see if there was in fact some sort of increased allocation of credit to the mortgage market, and if so, what sort of mortgages were being generated as a result. "To me it's still an empirical question. I don't know."

The Countercyclical Effects of FNMA

Herbert Kaufman summarized the theoretical arguments and the empirical evidence from previous economic research on the role of FNMA in moderating housing and mortgage credit cycles. He then presented his own econometric research on the effectiveness of FNMA during the 1980-1984 credit cycle.

Previous Research. The general conclusion of previous theoretical and empirical work is that FNMA had at least some countercyclical

impact in the 1970's, although it may have been significantly less than public policymakers believed at the time. This conclusion is not unanimous; some analysts have argued that FNMA and other federally sponsored credit agencies have had no net effect on the housing and mortgage markets, but merely have diverted funds from the private mortgage market. But most have concluded that FNMA has had some positive net effect, although much less than its gross volume of commitments or purchases; much of the gross effect is eventually offset by increases in interest rates, including agency and conventional mortgage rates.

Kaufman focused much of his attention on research by Dwight Jaffee and Kenneth Rosen. Their research was perhaps the most favorable to the argument that FNMA had a significant countercyclical effect. They argued that its effect depended on the fact that its activities in support of the mortgage market affected financial markets at different times. That is, FNMA first makes a commitment to buy a given mortgage; then at a later time, it may have to buy the mortgage, borrowing money in the capital markets in order to do so. Jaffee and Rosen argued that the time that elapsed between the commitment and the purchase allowed FNMA to moderate cyclical fluctuations. The commitment induces a housing start or sale. When the commitment must be taken down as a purchase, then FNMA's borrowing puts upward pressure on interest rates. Depositors may react to the rise in interest rates by withdrawing funds from mortgage-lending institutions to take advantage of higher yields on other investments.

In the period between commitment and purchase, the housing and mortgage markets are stimulated; when the purchase is made, the stimulus is largely reversed. The reversal may not occur instantaneously, however, but only over time as depositors adjust gradually to the higher yields available elsewhere, and lenders react to the changes in the structure of interest rates. In this case, there is a further lag, which may further enhance the countercyclical effect of the original commitment. The countercyclical effect may occur--and did occur during the 1970's--in that interim period. The period may last from about four to 12 months, before FNMA's purchasing activity drives mortgage and other interest rates upward.

A key finding, considering the present regulatory environment, is that the effect is much stronger when credit rationing occurs. Rosen has found that the net affect of FNMA commitments and purchases was greater during periods of credit rationing, and also that the impact came much sooner in such periods.

Much of the literature indicates that this countercyclical effect was largely endogenous. FNMA did not aggressively seek to moderate housing and mortgage credit cycles, but reacted rather passively to an increase in the volume of mortgages offered to it; the volume increased during periods of credit stringency and the absolute volume of FNMA commitments also rose.

Kaufman concluded his review of the literature with the statement that "FNMA's countercyclical role was modest though significant, particularly if the timing of its actions was considered."

Current Research. Kaufman then went on to present an econometric analysis of the most recent credit cycle. He suggested that the deregulation of mortgage lenders may have reduced the countercyclical benefits arising from the timing of commitments and purchases. The old pattern of disintermediation during "credit crunches" has become irrelevant. Mortgage lenders can now pay competitive market rates for their deposits, rather than lose them when rates rise above regulatory ceilings. Thus, the earlier research findings, such as Rosen's, have less applicability in the 1980's. In addition, and more importantly, traditional mortgage lenders are not limited in their asset choices as much as they were in the 1970's. If FNMA's activities drive down mortgage rates, traditional mortgage lenders can now purchase other assets instead of mortgages, offsetting FNMA's actions.

Kaufman's empirical work supports this hypothesis. He found no evidence that FNMA commitments or purchases had a significant effect on housing starts. His model included real income, nominal mortgage interest rates, and savings and loan mortgage commitments as well as FNMA activities. As additional, noneconometric evidence buttressing this finding, he cited FNMA's entrance in the MBS market, and its decision to begin purchasing second mortgages. Kaufman argued that both decisions apparently represented a decision to seek additional income, rather than to stimulate housing. (The effect of FNMA issuance of MBS has been discussed more extensively in the previous subsection.)

Discussion. The body of Kaufman's paper reported results with only housing starts as the dependent variable. He mentioned in passing that he had run similar equations with the volume of mortgage credit and the mortgage interest rate as the dependent variables, with similar results: FNMA activity was unrelated to either variable (after correcting for serial correlation). This result, however, was stated only in a footnote. Much of the general discussion of his paper turned on the question of whether the total of housing starts was the correct dependent variable. The issue was raised particularly by Warren Matthews of the Mortgage Bankers Association and also by Joseph Hu of Salomon Brothers. Kaufman responded that he had run regressions with many other dependent variables, and had "droves of computer output" with essentially similar results; the regressions reported in the paper were representative of the total body of work.

Discussant George von Furstenberg raised questions concerning the choice of independent variables. He felt that Federal Home Loan Bank Board (FHLBB) advances and also Freddy Mac activities should have been included. He also felt that real interest rates and household formations were relevant. He raised the possibility that high real interest rates and also home price disinflation may

have coincided with increased FNMA commitment activity, so that commitments would capture the effects of the omitted variables, which would have the opposite effect to commitments. The estimated effect of commitments would therefore be biased downward.

Timothy Howard of FNMA also raised concerns about the choice of independent variables, particularly the use of nominal dollar amounts of mortgage commitments when the dependent variable, housing starts, was in real terms, and about the use of a mortgage rate rather than the spread between mortgage and corporate or Treasury rates.

Von Furstenberg concluded that Kaufman's results were likely to be persuasive to those people whose prior expectations about the effect of FNMA were in accord with them. Chairman Downs asked if this meant that he was himself not persuaded by the results. Von Furstenberg said that he was persuaded because the results agreed with his prior expectations. However, he added that someone who disagreed with the conclusions would not "be demolished, nor would his viewpoint no longer be arguable," and that he did not find much of it very persuasive technically. He rated the work "a good try."

Kaufman, in rebuttal, stated that he believed the results were stronger than this. He had not approached the work with any prior view of the results, and had been surprised to find so little effect of FNMA activity, which was one reason he had done so much further empirical work. He agreed that the econometric results were not definitive by themselves, but argued that they supported the theoretical argument and therefore both theory and evidence deserved to be taken seriously.

Howard did not devote much attention to the subject of countercyclicality, apart from his questions about the research methodology. He did assert that FNMA's activity in standardizing and popularizing adjustable rate mortgages in 1982 and 1983 had caused them to be accepted more quickly, possibly resulting in a countercyclical effect, but went on to say that the effect might have been not so much countercyclical as secular. He also seemed to feel that FNMA's ability to drive down mortgage interest rates by channeling credit to housing had some countercyclical effect, but did not dwell on the point. (Most of his comments concerned the extent to which FNMA can channel resources into housing on a permanent rather than countercyclical basis; they have been reported in the previous subsection.)

More fundamental issues than research methodology were raised by some participants. Robert Van Order of HUD asked whether it was still, or ever had been, in FNMA's interest to act countercyclically, since it is a profit-maximizing institution with special privileges. Kaufman responded that his approach had been to ask whether FNMA had actually behaved countercyclically, not whether such behavior was in its interests. He felt that his econometric results, and the other evidence, indicated that FNMA had tended to

fulfill more of a private than a public purpose in the 1980's. Von Furstenberg added that FNMA could effectively act to stabilize the mortgage market by being "unhedged," having a mismatch of maturities between its assets and liabilities. Such action would destabilize its reported earnings; it might have higher average earnings, but less stability.

At the beginning of his comments, von Furstenberg raised the broader question of whether it was in the national interest to mitigate mortgage and housing cycles. He noted that Kaufman's paper simply accepted the goal, without discussion. Von Furstenberg himself was less willing to accept that goal, mentioning that housing is a normal casualty of disinflation and disinflation is now a goal of economic policy. He accepted the goal for purposes of the discussion at the conference, "less out of conviction than the desire to move on."

Chairman Downs concluded the discussion by asking if anyone at the conference had any evidence from their own past research concerning the extent to which FNMA was countercyclical. There was no response from the floor.

Benefits for Lower-Income Families

Richard Clemmer discussed the role of FNMA in providing housing assistance to relatively low-income households. He first discussed the statutory role of FNMA and its implementation by regulation. The bulk of his paper was devoted to measuring the extent to which FNMA's loans are concentrated at the lower end of the distribution of home buyers. He concluded with a brief discussion of special FNMA programs to benefit the poor.

FNMA's Statutory Responsibility. Clemmer began by quoting the Federal National Mortgage Association Charter Act of 1968. The Charter Act states that FNMA's basic purpose is "to establish secondary market facilities for home mortgages." FNMA is also directed to "provide supplementary assistance to the secondary market . . . by providing a degree of liquidity for mortgage investments." In addition, however, the Charter Act gives the secretary of HUD general regulatory power over FNMA, and states further that "The Secretary may require that a reasonable portion of the corporation's mortgage purchases be related to the national goal of providing adequate housing for low- and moderate-income families, but with reasonable economic return to the corporation." Clemmer interpreted this language to mean that FNMA's basic purpose is to facilitate the secondary market, and assistance to low- and moderate-income families is subordinate to its secondary market responsibilities.

He then discussed the 1978 regulations promulgated by HUD concerning housing for low- and moderate-income families. Such housing was defined as: (1) housing with mortgages insured by FHA under Sections 221, 235, 236, or 237 of the National Housing Act; (2) multi-family projects with at least 25 percent of Section 8

tenants; and (3) any single-family dwelling with a price not in excess of 2.5 times the median family income for the metropolitan area in which it is located. He provided some data on the first and third categories.

Subsidized Housing Programs. Clemmer reported that FNMA had actually purchased 46 percent of all Section 235 mortgages, and 65 percent of all Section 236 mortgages.

There was an extended discussion of these programs and FNMA's role. Clemmer expressed surprise that FNMA's purchases had been so large. Discussant Irving Margulies stated that FNMA at the time had no authority to buy conventional mortgages; it was restricted to FHA and VA mortgages and bought what was available.

Corso noted that most Section 235 mortgages had been originated by mortgage bankers, who would not have made the loans if they did not have someone to buy them, at the market price. FNMA served that purpose. Chairman Downs asked if someone else would have made the market if FNMA had not done so. Corso responded that it was "a good question."

Dale Riordan of FNMA described the 235 and 236 programs. The mortgages were simply FHA-insured, and were originated in the same manner as any other FHA loans. The difference was that they carried a commitment by the federal government to reduce the interest rate paid by the borrower, by making up the difference between the mortgage amortized at the market interest rate, and at a specified below-market rate. FNMA bought the loans at the market rate from the originators. Downs asked if this implied that FNMA did not accomplish any public purpose. Riordan said no; anyone else could have bought the loans at the same market price, but FNMA actually did buy them and still held them. Downs then asked if there was a reason why other people would not have bought the loans. Riordan said that he did not know, but the program was new and there was "a certain amount of uncertainty" as to how the mortgages would perform and how the program would work. He believed that a significant fraction of the loans would not have been made if FNMA had not been prepared to buy them.

Von Furstenberg strongly disagreed. If the loans were in fact bought by FNMA at the market rate, then someone else would have bought them and they would have been originated. If the rate at which FNMA bought them was below the market, then most or all of them would have been sold to someone else at a higher price if FNMA had not done so.

Chairman Downs observed that this implied that FNMA's purchases shifted some of the subsidy cost away from the federal government toward the borrowers in general. In this respect, FNMA might serve a public purpose.

Dolbeare noted that the total subsidy amount was fixed by the legislation; buying at a below-market price allowed more loans to

be originated under the program. Von Furstenberg agreed, but stressed that most of the loans bought by FNMA would still have been made and bought by other investors.

GNMA Tandem. Clemmer noted that FNMA had also bought mortgages as part of the GNMA Tandem Plan during the 1970's. Under this plan, GNMA originated mortgages at below-market interest rates and sold them to FNMA at a price that was close to the market price, but tended to be above it. FNMA was therefore implicitly subsidizing the mortgages, in addition to the direct subsidy provided by the below-market interest rate, and appropriated explicitly by Congress. Riordan said that the Tandem Plan purchases had cost FNMA about $100 million in income, "which we would certainly like to have right now."

Conventional Mortgage Purchases. The last criterion--mortgages on homes with a price of less than 2.5 times local median income--applied to conventional mortgages only. The regulations also set up a "trigger" of 30 percent for this criterion. If FNMA's conventional purchases of such loans fell below 30 percent of its acquisitions, "then that might trigger additional activities on the part of the Secretary of HUD."

HUD had originally proposed a criterion of the median home sales price in each area, but had changed to the income criterion in response to criticisms that median home prices were not available for each area. Median income data were available.

Clemmer calculated that a home with this price would be affordable by the median income household, using conventional rules of thumb, at a mortgage interest rate of 10 percent, which was about the typical rate in 1978 when the regulation was promulgated. But its affordability would change as interest rates changed. At higher rates, it would be harder to qualify for a loan, lower-income buyers would tend to be driven out, and the market would be dominated by higher-income families. Periods of higher interest rates are also periods when FNMA's profitability from its secondary mortgage market activities is likely to be reduced. The net effect is that FNMA is less able to meet the criterion, because of both the actions of potential homebuyers and its own financial situation, at the time when its assistance would most be needed.

This actually happened. In 1978, 33.5 percent of FNMA's purchases met the criterion, but in 1979 the percentage dropped to 25.7. In 1980, it rose to 29.2, but was probably higher because the income data lagged a year behind the price data.

Margulies, who helped to draft the 1978 regulations, stated in his discussion that the 2.5-times-income criterion was "a terrible mistake," and had been adopted only because of the lack of cost data.

Clemmer noted that reporting requirements in the 1978 regulations included mortgagor incomes, so it would have been possible to determine directly the extent to which FNMA was helping low- and moderate-income families, by any definition of the term. But the data were never used for that purpose.

The Distribution of FNMA Mortgages. Clemmer devoted much of his attention to analyzing the distribution of mortgage loans purchased by FNMA, by mortgage amount. He compared the FNMA distribution with that for conventional mortgages originated by savings and loan associations, reported by the FHLBB. The data were not strictly comparable, because the FNMA loans include one-to-four family dwellings as "single-family," while the FHLBB data are restricted to single-family homes. The average FNMA mortgage represents 1.2 dwelling units. "It's like saying someone with fewer than three spouses is single."

FNMA purchased a disproportionate share of loans with amounts below $60,000 in the first 9 months of 1984. This, however, can be accounted for by the fact that FNMA faces a conforming limit; it cannot buy mortgages with principal amounts above $115,300. When such loans are excluded from the Bank Board data, then it appears that FNMA buys a smaller share of loans in the lowest category, below $40,000, but is considerably above average for those between $40,000 and $60,000. These calculations also include a crude adjustment for the existence of two-to-four family units in the FNMA data. Even with the adjustment, the data "should be interpreted with extreme care."

Clemmer concluded that the conforming limit is the primary reason why FNMA purchases so many loans in the lower-priced categories.

In the discussion, Corso suggested that the low proportion of mortgages below $40,000 might be due to the existence of mortgage revenue bonds. Clemmer accepted the possibility. Riordan agreed that the conforming limit was probably the reason FNMA had targeted its purchases to lower-valued mortgages. He thought, however, that Clemmer's data (provided by FNMA) might have confused numbers of mortgage loans and dollar values. If the data were for the latter, as he thought, then the number of lower-valued loans would be greater than Clemmer's paper showed. The question was not resolved at the conference.

Discussion. The two formal discussants took widely different positions. Cushing Dolbeare argued that FNMA should be required to do more for low- and moderate-income households, such as making the conforming limit more geographically sensitive, adjusting it for differences in housing costs and incomes. She felt that FNMA had done well in buying Section 235 and 236 loans, but felt it could have done more to prevent the large number of foreclosures in these programs. It should have acted not only as a neutral financing mechanism, but also have attempted to protect the federal investment, as part of its commitment to low- and moderate-

income housing. She acknowledged that some of the projects had not been very well designed, or located, to begin with.

Dolbeare felt that there are "enormous unmet needs for additional housing assistance at the very bottom of the income scale." FNMA cannot do very much without federal subsidies for very low-income families, but might be able to do some things. She mentioned reverse annuity mortgages for low-income elderly homeowners as one example. FNMA could also have a much more aggressive program to promote rental housing, which serves relatively low-income households, although she was concerned that tax code changes might make rental housing in general much less attractive as an investment. Finally, she wanted FNMA to try to be sure that "it doesn't do any harm" to low- and moderate-income households, citing displacement resulting from gentrification in declining neighborhoods.

Irving Margulies reviewed his experience in helping to write the 1978 regulations. The writers had operated on the premise that there should be some public purpose to the subsidy provided to FNMA, and that besides allocating credit to housing, the public purpose might include doing something for lower-cost housing. They were asserting the sovereign's interest and right to allocate the value of the subsidy, which right reposed in the Secretaries of HUD and the Treasury.

In this respect, the regulations were "an absolute failure" and provoked a firestorm of opposition. Housing and mortgage industry groups were afraid that HUD involvement in the interests of low- and moderate-income families would undercut the ability of FNMA to allocate credit to the housing market generally.

Margulies now felt that probably the only thing FNMA can do is channel credit to housing. It cannot efficiently allocate credit to the poor, the central cities, or other areas of public policy concern. "I would walk away from (that activity) entirely."

He also felt that it was important to distinguish between housing and income problems. If people are poor, dollars can be transferred to them; if there is an inadequate stock of housing, programs can be devised to add to it. "But a program that tries to add to the housing stock by allocating units to poor people is doomed to disaster always." In response, Dolbeare argued that "you also have the problem that the people with the least money live in the poorest housing."

Von Furstenberg argued for a different approach to the question, rather than measuring FNMA's activities by which households receive the subsidy. It does not matter which mortgages FNMA buys; the effect is to reduce mortgage rates generally, relative to other rates, benefitting all mortgage borrowers, regardless of income. (He qualified this because of tax factors; a given reduction in the before-tax mortgage rate affects households

in different income and tax brackets in different ways, and is inherently progressive to that extent.) The mortgage data used by Clemmer might be "public relations" for FNMA in its dealings with Congress, "because they all believe that the effect stays where it seems to be. If you buy low-income mortgages, you have low-income housing. It doesn't help anyone else." He termed this argument "eyewash."

Clemmer agreed that the precise allocation of funds by income or mortgage amount does not matter very much, and said that he had discussed this proposition in more detail in the paper.

Dolbeare disagreed. She felt that there are some groups and activities that are not helped by general assistance to the mortgage market, mentioning community nonprofit organizations trying to develop limited-equity co-ops or rehabilitate housing. Conventional financial institutions are unwilling to lend them money. FNMA should try to help where the market is not operating for low- and moderate-income households. Barry Wides of the Office of Management and Budget asked if Dolbeare could provide further examples after the conference.

Special Programs. Clemmer concluded his paper with a brief listing of special FNMA programs for low- and moderate-income families. These include some that are location-specific, such as municipal tri-party participation plans in five cities, a commitment to the predominantly minority National Association of Real Estate Brokers, and a commitment to the National Housing Services of America to support rehabilitation of rental housing in low-income areas. The total commitment in these programs is $175 million.

General programs include purchasing loans where mortgage credit certificates are used, and providing financing for homes built under HUD's affordable housing program. Both are not yet operational, and are likely to be small.

A third category includes larger programs with greater potential to affect low- and moderate-income families. FNMA has aided in financing $850 million of mortgage revenue bonds. It has begun to purchase multi-family mortgages, financing 100,000 units annually by its own estimation, and to purchase manufactured-housing loans and the new FHA-insured Adjustable Rate Mortgages (ARMs). All of these tend to serve relatively low-income families.

Riordan commented that FNMA had bought $800 million worth of conventional multi-family mortgages in 1984, and planned to triple that activity in 1985. He also mentioned mortgage credit certificates as an example of innovation by FNMA (discussed in detail in the next subsection).

The two discussants again took quite different views of these programs. Dolbeare felt that Clemmer had dismissed these programs

too casually; the programs have potential, have had some achievements, and should have more. She mentioned reverse annuity mortgages for the elderly as an example of possible innovation. Margulies termed the programs merely "corporate giving in a sense, programs that indicate social responsibility." They are small in comparison to the total activity of FNMA.

Other Public Purposes

Von Furstenberg began his comments on Kaufman's paper by stating that "one of the things government-sponsored agencies do particularly well is to devise a rich variety of rationales for their continued existence. This has the advantage that replacement rationales can be called to the front as soon as an existing rationale falters."

But during the course of the discussion, only a few other public purposes were suggested, and only one by FNMA representatives.

In his discussion of FNMA's role in helping low- and moderate-income households, Riordan extensively developed the argument that FNMA performs a research and development function. It has been an innovator of new mortgage products, and it provides a market for new products that other entities are not willing to take a chance on, at least initially. This was true in the case of Section 235 and 236 during the early years of FNMA's existence. He mentioned mortgage credit certificates for first-time homebuyers, created as part of the legislation extending mortgage revenue bonds last year. Senator Dole and others had asked FNMA to help devise a formula that would make these certificates salable in the secondary market, at first to FNMA but over time generally acceptable to other purchasers as well. FNMA has announced plans to purchase the certificates when they are issued in the near future. As an example of possible future innovation, Riordan cited reverse-annuity mortgages and sale-lease transactions, particularly the former, where FNMA wanted to work with the few lenders who have already been making reverse-annuity mortgages and help to develop the right product for the secondary market.

Chet Foster of HUD supported the general proposition that market imperfections may exist when a new program is developed, particularly a subsidized program. FNMA had proved to be the residual risk-taker in the Section 235 and 236 programs, as they turned out to have high default rates.

Matthews stated that FNMA has performed a public purpose in standardizing mortgage instruments, citing adjustable rate-capped mortgages as a recent example.

James Clarke asserted that, in the absence of FNMA, there would not be a private mortgage market. Savings and loans and mutual savings banks would not operate in the present world of

volatile interest rates if there were not a very efficient secondary mortgage market. This provoked some disagreement. Chairman Downs suggested that Freddy Mac and GNMA could serve the same purpose. Clarke questioned that pools and MBS could efficiently handle the entire secondary mortgage market without FNMA. Van Order felt that they could, in the long run; indeed he did not see why savings and loans needed the secondary market services. They already have many of the things that FNMA provides: a national market in which to raise funds, with deposit insurance, for example. "If there were no FNMA and had never been one, I don't think we would miss it." Kaufman added that innovations in the private liquifaction of mortgages were adding to the impact of GNMA and Freddy Mac.

THE FINANCIAL POSITION OF FNMA

Prof. Clarke described the present financial position of FNMA. His discussant, Prof. Kane, was more concerned with the incentive structure that presently confronts and constrains FNMA, and its implications for the future. These two topics are undoubtedly central for public policy. The second paper in this general subject area, by Prof. Vandell, was concerned with a smaller issue: the analysis of the default risk faced by FNMA as a result of its recent and increasing purchases of ARMs. This section describes the papers and discussion on each topic, beginning with the current overall position of FNMA.

The Interest Rate Risk Confronting FNMA

James Clarke presented an analysis of the portfolio risk, specifically the interest rate risk confronting FNMA. In order to do this, he constructed a detailed balance sheet for the Association for the year 1983, estimating coupon and maturity for all earning assets and liabilities, and then used the balance sheet to evaluate the interest rate risk.

FNMA has a maturity mismatch between assets and liabilities, the former being long-term and the latter much shorter. Rising interest rates have therefore resulted in losses in 1981 and 1982, due to the excess cost of outstanding debt over the yield on the mortgage portfolio. In 1983, this spread was still negative, but FNMA earned enough in other ways to have positive net income.

Asset Portfolio. FNMA's mortgage portfolio increased by about 50 percent between 1979 and 1983. Traditionally, it bought government-insured mortgages, but by 1979 purchases were split almost evenly between government-insured and conventional ones. In 1982 and 1983 conventional mortgages accounted for well over 90 percent of all purchases.

In recent years FNMA has begun to buy new types of mortgages that should reduce its risk from fluctuating interest rates.

These include particularly ARMs and second mortgages, which between them amounted to almost a third of purchases in 1982 and 1983.

It also has begun to sell mortgages for the first time. Sales in 1982 and 1983 were primarily for two purposes. The first was to maintain a steady flow of new issues of MBS. FNMA pools mortgages from its own portfolio or purchases mortgages and sells the MBS certificates. This program is modeled after the GNMA MBS program, and is currently playing a large role in FNMA's operation. It allows FNMA to increase the liquidity of mortgages without having to take the interest rate risk on the pooled loans.

The second purpose was to reduce interest rate risk at a reasonable cost. In 1982 and 1983, FNMA took advantage of a moderating interest rate environment to sell off some of its mortgages with rates below the current market.

Clarke noted that FNMA has behaved differently in the past. He found little evidence that it had behaved countercyclically in its portfolio activities during the 1970's. It had purchased large dollar amounts of mortgages in years of both low and high savings inflows into savings and loan associations, and had rarely sold mortgages even during the latter years, although its secondary market function "implies the sale of mortgages from FNMA's portfolio when liquidity is abundant." It was clear that FNMA would now have a better asset-liability maturity match if it had sold more mortgages during the 1970's, and would have a higher return on its assets. He attributed its failure to act countercyclically to two factors: "the intense political pressure . . . to maintain lower borrowing costs to home buyers," and the difficulty of forecasting interest rates. During the rising rates of the 1970's, FNMA, as well as most other mortgage lenders, continually assumed that each new historical high would turn out to be a historical high and that rates would eventually decline to more normal levels. Thus, it did not seem prudent at the time to sell mortgages, when in hindsight, it would have been.

Clarke also noted in passing that FNMA changed its commitment procedure in 1981 to provide it with more protection from interest rate fluctuations.

Liabilities. FNMA finances its portfolio primarily with debt. Roughly one-third of its liabilities are notes with maturities of less than a year; almost two-thirds are debentures with maturities of 3 to 25 years. FNMA thus has the ability to lengthen the maturity of its liabilities, which is important in interest rate risk management. During recent years, however, its liability structure has shortened considerably, from an average of 39 months in 1979 to 27 months in 1982; it lengthened slightly to 29 months in 1983.

FNMA's other sources of funds, noted in passing, include a $2.25 billion guarantee from the U.S. Treasury to purchase its

debt at the Treasury's borrowing rate, commercial lines of credit, the issuance of FHA mortgage-backed bonds that are guaranteed by GNMA and therefore are obligations of the federal government, and the sale of stock.

Balance Sheet Mismatch. With long-term mortgages and short-term liabilities, FNMA, like thrift institutions, suffers when interest rates rise. Banks and money market funds, with matching asset and liability maturities, are able to adjust to rising rates; institutions with mismatched portfolios are not. Interest rate volatility compounds the problem, making it harder to restructure portfolios because of uncertainty. Since 1979, FNMA's interest margin--the difference between total interest income and costs--has fluctuated, dropping from $322 million in 1979 to -$506 million in 1982, and then improving to -$62 million in 1983. In terms of mortgage yield and debt cost, the latter exceeded the former by 6 basis points in 1979, rising to 157 basis points by 1981, and then falling to 42 basis points in 1983.

Measuring Interest Rate Risk: Gap Analysis. To measure the interest rate risk, Clarke first allocated all interest-rate-sensitive assets and liabilities to "gap periods"--dates in the future at which they could experience contractual changes in interest rates or could be repriced with respect to the interest yield. On the asset side, this requires information on the terms of ARMs, and on prepayment and amortization; on the liability side, the maturity structure of FNMA's debt.

Clarke created gap periods of less than one year, one-to-three years, three-to-five years, five-to-ten years, and more than ten years. He assumed that all of FNMA's fixed-rate mortgages fell in the latter category because 20 years ago the portfolio was about $2.5 billion of 30-year fixed-rate mortgages, compared with a total portfolio of $77.5 billion in 1983. ARMs were divided evenly into the three intermediate periods. Clarke termed this "a very naive assumption, but about the only one I can make," in the absence of data on the period between interest rate adjustments. Prepayment posed a particular problem; after considering several alternatives, Clarke chose to use the FHA Experience Table for FHA-insured mortgages issued since 1957. Comparison of actual 1984 experience with the projections in the Table indicated that this procedure worked reasonably well, in most cases. Conventional fixed-rate mortgages were an exception; prepayment was almost 50 percent higher than the table implied. Clarke attributed this to the fact that mortgage rates in 1984 were well below their 1981 and 1982 levels. For prepayments on second mortgages and ARMs, he used FHLBB projections, adjusted to reflect higher actual rates of prepayments in 1983, again presumably as a result of the higher mortgage rates in the immediately preceding years.

Clarke also estimated the average coupon and maturity on the government-insured and conventional mortgage portfolios. Coupons were 9.10 and 12.17 percent, respectively, and maturities were 20.9 and 26.5 years, respectively.

These data and assumptions imply a substantial gap. About $10 billion of FNMA's rate-sensitive assets reprice within a year, compared with $27 billion in liabilities. At the other end, almost $30 billion in assets reprice only after ten years, compared with less than $1 billion in liabilities. The unhedged gap in the shortest period amounts to 21.3 percent of total assets; the gap from one-to-three years, another 15.6 percent.

Duration Analysis. Clarke briefly presented some comments on duration, taking into account the fact that the cash flow from mortgages is spread throughout the life of the assets more or less evenly, unlike a bond portfolio. He measured the average weighted life of the cash flow from the portfolio at 9.11 years. Discounting the cash flow and assuming a flat yield curve, he estimated the duration of the cash flows from the assets at 4.68 years, and the duration of the liability cash flows at 2.04 years.

Policy Implications. Clarke concluded with some suggestions and comments on FNMA's strategy for managing its "significant negative gap." He noted its activity in buying second mortgages and ARMs, to shorten maturities, and in issuing MBS, which do not require it to assume the financing or spread risk on the pooled mortgage loans. He also suggested sales of some mortgages "at a moderate loss," during the present period of moderating interest rates, which should result in improved earnings for FNMA in late 1984 and early 1985.

Clarke then turned to the liability side. FNMA's situation is not unlike that of many thrift institutions, but it has a slight advantage over them in being better able to lengthen the maturity of its liabilities, particularly by issuing notes in the three- to seven-year agency note market. FNMA's average maturity is already much longer than thrift institutions', and it should extend its maturity further.

Finally, Clarke mentioned opportunities in the futures market. FNMA has done some hedging of optional delivery standby commitments, which give a put option to the mortgage seller, the right to sell the mortgage to FNMA at a fixed price over a given time period. It also conducts "micro hedging" on the liability side, locking in the cost of debt prior to actual issuance of the debt instruments. But FNMA has not attempted "macro hedging--actual hedging of the gap." Its hedging department is sophisticated and experienced enough to make macro hedging worth investigating. Clarke noted that thrift institutions have taken the same approach, and might also benefit from macro hedging.

Dicussion. There were relatively few comments on Clarke's paper. The formal discussant, Edward Kane, called the paper "an excellent review of the recent evolution of FNMA's financial intermediation activities," and had "nothing but praise for the way that Professor Clarke lays out the facts." He felt that Clarke, in describing FNMA's efforts to manage the gap, had concentrated on the asset side, the ways in which FNMA had sought to shorten the

maturity of its assets, rather than on efforts to lengthen its maturities or change its equity capital position.

Kane offered one specific criticism. Based on his own continuing work (in collaboration with Chet Foster of HUD), he believed that Clarke overestimated the duration of FNMA's liabilities by about four months--a duration of around 1.7 years instead of 2.0. He attributed this to rounding error--Clarke's shortest brackets, less than one year and one-to-three years, are too gross; the average maturities of debt maturing within those periods are considerably less than the midpoint of the ranges. On the asset side, his and Foster's estimate of duration agreed with Clarke's to one decimal place.

Howard described in detail FNMA's efforts to match durations of assets and liabilities. The duration of assets can only be estimated, because the duration of a mortgage is never known in advance. But FNMA does set targets for the products that it buys. FNMA does have access to a wide range of maturities, through both domestic capital markets and the Euromarket. If it finds that it is not able to buy the types of product that it originally intended, it can adjust its liability duration on the margin. A duration match with a tolerance of half a year is manageable.

FNMA Risk-Taking and Federal Guarantees

In his discussion, Kane went beyond the description of FNMA's balance sheet and interest rate risk problems in Clarke's paper to present an analysis of FNMA's risk-taking, focusing on the role of the subsidies inherent in its federal guarantees. He first explained how the subsidized guarantees let FNMA expand its risk-taking, then reported estimates of the magnitude of the risk exposure and the cost of the federal guarantees, and finally discussed policy options for restraining the extent of risk-taking.

How FNMA Risk-Taking is Subsidized. Kane noted that all federal guarantees to FNMA, except the $2.25 billion line of credit mentioned by Clarke, are implicit and conjectural. The Treasury and the Federal Reserve are not empowered to rescue FNMA from insolvency, but sophisticated investors recognize that strong political pressures would prevent de jure insolvency; otherwise, they would have already driven it into bankruptcy.

FNMA's de facto insolvency and the cost of these guarantees are unrecognized by FNMA officials or policymakers, because they are not measured properly in the federal budget. They are measured in terms of the cash flow they create, rather than the contingent cash flows they threaten to occasion in the future. The government does not set aside any contingency reserve. Thus, it is profitable for FNMA or other guaranteed corporations to sell its guarantees by buying mortgages, because "it's always going to book a profit from doing this and it will book a profit until somewhere down the line things might come to roost."

Kane agreed with Clarke's analogy between FNMA and thrift institutions. "To my mind, FNMA is a giant thrift, or thrifts are little FNMAs." He extended the analogy in order to analyze "the uncontrolled subsidization of FNMA." FNMA can buy moderately risky debt (of the quality of Baa bonds, for example) with government-guaranteed debt and earn 100 to 150 basis points on each dollar. The Treasury charges no explicit or implicit fee for the guarantee.

The administration's proposal to impose a flat user fee on FNMA debt of 5 to 8-1/3 basis points is clearly inadequate, in the face of this differential and the cost of financing the guarantees (to be discussed later). Moreover, by strengthening the perceived quality of the guarantee, it could increase the flow of gross subsidies by more than the fee, perhaps 15 to 20 basis points. "I'd recommend buying FNMA stock."

In the case of savings and loan associations, they are charged for the guarantee provided by the Federal Savings and Loan Insurance Corporation (FSLIC). The explicit premium is 8-1/3 basis points and an increase is being considered. In addition, FSLIC is taking "very energetic action though not always very effective action" in the form of additional controls on association risk-taking, but interest rate volatility has rendered the control system less effective.

The absence of a fee for the guarantee gives FNMA strong arbitrage incentives to take risk, constrained only by the need to act countercyclically in conformity to its policy mission, and fear that too aggressive a policy would offend government officials and induce administrative controls. Otherwise, FNMA's stockholders are best served by as much leverage and risk-taking as possible, and it would be unethical for FNMA's managers to ignore their stockholders' interest.

Measuring the Value of the Guarantee. Kane reported on work in progress being conducted by him and Chet Foster for HUD. They measure the value of the guarantee by augmenting the standard balance sheet. In addition to bookable assets and liabilities, they would include unbookable ones, such as the guarantee. They would then measure the net value of bookable assets minus liabilities, compare it with the value of the stock, and identify the difference as the value of the guarantee. (They assumed that loan commitments, net of futures positions, have a zero duration and that any franchise values possessed by FNMA are being squeezed to zero by the expansion of MBS and electronic mortgage-origination networks. This leaves only the federal guarantee as an unbookable asset.)

The value of the guarantee, measured in this way, went above the value of the $2.25 billion explicit line of credit in 1979, peaked at over $12 billion in 1981, fell to $7.5 billion by 1983, and rose to about $8 billion in the first half of 1984.

They also measured changes in the duration of assets and liabilities since 1983. After comparing their figures for 1983 with Clarke's (as noted in the previous subsection), Kane pointed out that the duration of both assets and liabilities has been falling on average since 1978. This fact is not widely recognized. However, the gap in duration rose sharply in 1979 and remained above four years until 1982. It then fell to about three years at the end of 1983--the date at which it was measured by Clarke as 2-2/3 years--and increased by a few months in the first half of 1984. "This is not a picture of a corporation striving single-mindedly during these years to curtail its risk-taking activities." FNMA is also trying to position itself to earn its way back to de facto solvency if interest rates decline sharply.

The distribution of gains and losses from interest rate movements is not shared symmetrically by the Treasury and FNMA's stockholders. Kane measured the change in the value of the stock against the change in value of the bookable assets minus liabilities. He found that during portfolio upswings since 1978, FNMA stockholders have profited to the extent of about three times as high a proportion of the total portfolio gain, as they have lost during downswings. "This is to be expected with contingent guarantees. By and large, when you're well 'under water,' further losses pass through almost dollar for dollar to the guarantor, whereas some improvement increases the chances" for ultimate solvency.

Kane then presented a measure of the annual value of the subsidy implied by the guarantees. This depends on the change in the market value of the guarantee, measured above, and the cost of financing it, net of any interest rate premium because of the conjectural nature of the guarantee. The annual cost as of mid-1984 is between $1.0 billion and $1.5 billion. As a percentage of FNMA's aggregate debt, the interest cost alone amounts to 120 basis points annually. This is a far better measure of the cost of the guarantee than the fact that there have been no direct federal budget outlays to date.

In this light, the previously mentioned administration proposal to impose a user fee of less than 10 basis points is clearly inadequate. If FNMA were instead required to reimburse the Treasury for the value of the two cost components, its annual subsidy could be eliminated. To prevent FNMA bankruptcy, its liability would have to be backed by contingent claims against its stockholders, similar to the double liability applicable to owners of stock in national banks before the mid-1950's.

Policy Recommendations. Kane argued that FNMA is effectively uncontrolled by its guarantor, in contrast to federally insured deposit institutions. HUD's oversight responsibility does not serve to provide a framework for imposing costs in return for the guarantee; only the need to serve housing interests and concern about future political consequences act as effective checks on FNMA risk-taking. Therefore, "FNMA has repeatedly bet more than

its privately supplied equity account on the course of future interest rates." It pays FNMA to take risks; "they're getting better odds than you or I would." (The same was true of Financial Corporation of America, which in 1983 and early 1984 was in effect leveraging its FSLIC guarantee.) It isn't necessary for interest rates to move much in order for FNMA to find it profitable to buy mortgages, since a large part of the risk is picked up by the Treasury. Its strategy was therefore to increase its exposure to losses from interest-rate increases from 1978 to 1981, "when losses on its existing bets drove its net-worth position more deeply under water . . . . Although FNMA has recorded gains over the last few months, their bets remain on the table and the financial roulette wheel spins anew each day . . . . and we're the ones that back the losses . . . . We don't have the right kind of security for the funds the taxpayers are providing."

Kane identified three types of policy solutions to the problem. One, disavowing the guarantees, is very unlikely politically. The others are explicit pricing or administrative controls to limit the amount of subsidy. He then listed five ways of implementing either approach:

1. Ex post settling up, by giving the Treasury warrants for FNMA stock or using the Kane-Foster model to calculate the bill for the guarantee, not necessarily charging 100 percent of the value.

2. Institute controls, perhaps gradually, on FNMA's duration gap and portfolio growth.

3. Require 100-percent insurance of FNMA's unhedged positions; subordinating new debt to old would be a step in this direction.

4. Establish an asset-liability committee at HUD to manage FNMA risk exposure.

5. Give public purpose interest directors a dominant position on the FNMA board.

Kane concluded that political and practical problems made these solutions unlikely. Even though private insurance companies and securities markets make comparable decisions daily, "to bureaucrats and politicians an adequate pricing solution seems unacceptably hard to execute" and defend against implacable political opposition. Milder control options face enforcement problems and may have the perverse effect of strengthening the perceived value of the guarantee by increasing the government's involvement.

FNMA Risk-Taking and Federal Guarantees: Discussions

Kane's analysis provoked an extensive and lively discussion, covering all three topics that he addressed.

FNMA's Incentives. FNMA's Tim Howard focused on the argument that FNMA has an incentive to take excessive risk. He stressed that FNMA is not abusing its guarantee or behaving irresponsibly. FNMA is not "running around buying mortgages long and funding them short to postpone an inevitable date with the grim reaper." In 1980 and 1981, FNMA did to some extent "double its bets," but in that economic environment, it had to; the portfolio was losing $500 million at an annual rate. If it had simply matched asset and liability duration, it would have gone bankrupt. Moreover, restructuring possibilities were limited by the choices available in the market.

However, FNMA has moved to improve its duration match. At the end of 1980, the portfolio had a duration gap of 3 years (5.2 years asset duration vs. 2.2 years liability duration). From that date to mid-1984, its marginal duration gap was only 1.1 years--new assets had a duration of 3.5 years; new liabilities, 2.4. During 1984 as a whole, the gap was only half a year--3.7 to 3.2. "To me that does not sound like FNMA management abusing the value of the implicit government guarantee and doubling its bets. We take the notion of reducing the risk of the portfolio terribly seriously."

Howard acknowledged the importance of the implicit guarantee, and said he had never refused to acknowledge it. If the guarantee were taken away, FNMA could not borrow and it could not be in the portfolio intermediation business. "That's it." If FNMA is charged explicitly for the value of the guarantee, FNMA is put out of business. A private institution without the guarantee could not operate profitably; if it could, "I dare say somebody would be doing it."

Kane subsequently responded that unsubsidized private institutions were presently unable to compete with FNMA and savings and loan associations, both with subsidies. To some extent the subsidies are shifted into the interest rates, and a private institution would face the same rates without the subsidy.

Kane said that Howard was admitting de facto insolvency in saying that FNMA could not function without its guarantee. He agreed that FNMA had reduced its duration gap, but market leverage also went down and the portfolio size increased by half. "Those were activities that were designed to redouble the bet." Howard responded that FNMA could not totally control these factors. Given the economic environment, it was necessary to raise the size of the portfolio in order to generate enough earnings on the margin and offset the cost of rolling over the debt on the old portfolio.

Chairman Downs said that FNMA would have gone broke if it had chosen not to increase its portfolio at the end of 1980. Kane agreed, but stressed that the loss would then have been borne by stockholders and bondholders, and not the taxpayer. The Treasury would have borne a lot of the loss, because of tax write-offs, but

not all of it (as it does in the present situation). "The lessons that would have come from that, would have saved us some pretty severe excesses."

Howard was personally offended at the charge of irresponsible behavior and abuse of the guarantee. Kane replied that no personal reference was intended; FNMA was acting responsibly in the interests of its stockholders, and he would have tried to do the same thing in the place of FNMA's management.

Measuring the Federal Guarantee. Chairman Downs and several other participants addressed the nature and measurement of the value of the federal guarantee.

Downs first raised the question of how much of FNMA's behavior was caused by the existence of the guarantee, and how much was speculation. Kane responded that it was more important to ask what was the cost that is ultimately imposed on the taxpayer.

Downs questioned the validity of the Kane-Foster measure of value. He asserted that many large corporations also show no close comparison between their book value and the market value of their stock. The fact that the latter was higher than the former was the explanation for stock market takeovers in general. It did not necessarily measure the value of the guarantee for FNMA. Kane said it had not been shown that market value of stock exceeded book value in general. "I've never seen any evidence on it. We do not have market value accounting." He added that takeovers are often based on the belief that current management is incompetent, which is not the case with FNMA; its activities are very straightforward and there has been no claim that it is not well managed.

Von Furstenberg said that it is desirable to make the kind of calculation that Kane had described, but it is also important to make the same calculation for other financial institutions. The difference between book and market value tends to vary dramatically between industries in the U.S. economy. Kane responded that such comparisons are useful, but it is also worth noting the variation in the value of unbooked items over time, particularly the pattern since 1978. Economic analysis implies that the guarantee should increase greatly in value when interest rates are volatile, and this in fact happened. There could be other explanations for the difference, but there is supporting evidence that it essentially reflects the value of the guarantee. The same analysis explains the stock prices of thrift institutions, with their deposit insurance. Otherwise, "why in the world would these things sell at positive prices?"

Several analogies were offered to clarify the nature of the guarantee, and to distinguish it from budget outlays. Kane presented the hypothetical example of his son's friend; his son asks him to guarantee his friend's debt of $100,000. "The guy looks like a very unreliable character, but my son wants me to do it. And I guarantee it." The debt is outstanding for a long time, but

eventually is paid off. "Did this cost me something, to issue that guarantee? I say it sure did. I wouldn't sleep very well for a long time. I'd be setting aside a reserve." Downs asked if the government was losing sleep over FNMA, which occasioned laughter.

Robert Van Order of HUD offered an analogy with insurance. He termed it "a particularly messy problem" because the event may well be very unlikely to happen, but will cost the insurer a large sum if it does. He thought a formal attempt to measure the probability of FNMA going bankrupt was beyond possibility: "I don't think we have the faintest idea of how to set up a model." But in the real world, people are buying the securities, and analysts can try to infer at least what they must implicitly be thinking about the value of the guarantee, and this was what Kane was trying to do. The fact that people are willing to buy the stock certainly indicates that they think FNMA has a positive net worth.

Von Furstenberg offered two analogies. As a generalized example, suppose the government makes a promise to give someone a grant in ten years, and the promise is generally believed; then the prospective recipient enjoys a higher net worth and the government has increased its net liabilities, even though no money has changed hands. The existence, or not, of a sinking fund does not affect the value. A more specific example is Social Security: benefits aren't funded, there is a high net unfunded liability, but people expect the benefits to be paid, assign a value to them, and take that value into account in their financial planning.

Downs acknowledged the comparison, although pointing out that Social Security is funded to some point, but not for all prospective beneficiaries. He also argued that the future guarantee does not have the same economic value as a cash outlay. Von Furstenberg agreed that the guarantee was not equivalent to cash, because it is contingent on events which may not happen; its value must be adjusted for the probability of being called into force to get a certainty equivalent.

Downs finally accepted Kane's theoretical argument that there is an implicit value to the guarantee--there is an "invisible stake" on the table--but was still dubious about the measurement of its value. Kaufman stressed the importance of the measurement, if it were to be used as the basis for a charge imposed on FNMA. Downs asked Kane if the guarantee would still have value in the event that interest rates fell by 300 to 400 basis points. Kane thought its value would be very small, but the guarantee would still exist and would have some positive value.

Glen Corso of the Mortgage Bankers Association asked Kane if his estimate took any account of the statutory restrictions imposed on FNMA's assets. Kane said that he did this implicitly, and that the restrictions do not affect FNMA's ability to leverage its guarantee or limit the interest rate risk that it can take.

Policy Implications. Barry Wides of OMB asked for further explanation of the difference between Kane's proposal for ex post settling up--charging FNMA for the value of the guarantee that the government provides--and the administration's proposed fees for government-sponsored enterprises, contained in its FY 1986 budget. He was concerned about Kane's statement that the fee proposal underpriced the benefit to FNMA; Kane had said it would be charged 5 to 8-1/3 basis points for a guarantee worth 25 basis points. Kane responded that charging for the guarantee has the effect of making the guarantee more binding on the federal government. At present, FNMA borrows for about 25 basis points more than the Treasury; the difference captures the fact that the guarantee is conjectural in large part, rather than firmly established and explicit. Charging a fee would make the guarantee perfect, so that FNMA would essentially be issuing government debt, and selling it at the price of government debt. Kane argued that ex post charges for the value of the guarantee would not change the conjectural nature of the guarantee, but acknowledged that it could perfect the guarantee to some extent, and thus increase the value. But the government would be charging for the value that it conferred. Robert Buckley of the Urban Institute said that the government's decision not to charge for the guarantee in effect placed a bet that the loss will never be realized, but doing so "multiplies the number of invisible stakes . . . . We are making more bets because we don't want to realize the capital loss."

Kaufman asked if Kane's proposal was based on an economic analysis of its merits or a political judgment that the government would be unwilling to let FNMA be privatized, without guarantees. Kane said the latter was the basis. One approach would be to create a "non-federal national mortgage association, or NANNY MAE," with no guarantees, in place of FNMA. But the political process would probably result in large, expensive benefits to FNMA, as part of the transition. He then reiterated that there were other alternatives besides charging for the value of the guarantee. One not previously mentioned would be for the Treasury to renounce FNMA guarantees; it could then buy up FNMA's debt and stock "pretty much at the price it chose;" subsequently he offered an estimate of 95 cents on the dollar. (Downs observed that this plan would "not necessarily uphold the face value of the debentures and notes of FNMA.") FNMA would essentially be re-federalized and the government could dictate policy, instead of allowing FNMA to take advantage of the guarantee and increase the government's exposure to risk, as at present. He thought there was essentially no difference between privatizing FNMA with some recapture of benefits, and charging for the guarantee.

Kane felt that oversight and review of FNMA's activities is critical, and an important element of its charter. He thought the political rhetoric about insolvency made it more difficult to conduct a meaningful debate, but a measure of the probabilistic loss to the government would contribute to better policy-making.

Kaufman and Downs discussed the rationale for the current policy. Downs suggested that one important reason is "to avoid facing up to the loss in the portfolio." This might in fact be FNMA's social purpose. Kaufman said that the basic question still remained: whether to "unwind the position." Avoiding the issue simply affected the way in which the problem would ultimately have to be addressed. He preferred to develop a feasible method of resolving the problem, rather than avoiding it.

Default and Credit Risk from ARMs

Kerry Vandell was concerned with a much narrower question than were Clarke and Kane. Vandell analyzed the credit risk posed by FNMA's recent large-scale purchases of ARMs. He looked at both the default experience to date and, more extensively, the future default potential.

Vandell began by remarking that FNMA had lost $70 million through foreclosures on conventional loans during the first nine months of 1984, a figure more than 70 times larger than the losses as recently as 1981. These large losses coincided with ARMs purchases, raising the question of whether the defaults were concentrated in ARMs. During the first nine months of 1984, ARMs constituted 22 percent of FNMA's conventional loan portfolio, and 39 percent of purchases. In 1981, they represented less than one percent of the portfolio, and less than three percent of purchases.

Vandell described in some detail the various types of ARMs that FNMA has purchased. He identified 14 different plans, and also pointed out that FNMA has a nonstandard loan window, through which it may buy still other types.

These instruments can vary along several dimensions. They may have limits on the maximum adjustment, either over the life of the loan, at any given time, or both. Either the interest rate or the payment change may be capped. If the latter is capped, then there may be negative amortization, if the mortgage rate rises by more than the payment cap allows. FNMA limits negative amortization to 125 percent of the original principal balance; if that point is reached, the mortgage becomes fully amortizing, imposing much higher monthly payments to the mortgagor. In addition, the payment stream may be graduated, as with a graduated-payment fixedrate mortgage; and there may be initial buydowns or discounts.

Unfortunately for Vandell's analysis, FNMA does not make public detailed information on the characteristics of the ARMs that it actually buys or the share of its portfolio that each type constitutes. There has, however, been a rather strong trend toward standardization of ARMs in the national mortgage market, with the "5/2" loan becoming most popular. This loan has a five percent cap on the interest rate increase over its life, and a two-percent

maximum annual rate increase cap. Vandell offered some indirect evidence that FNMA is probably concentrating its current purchases in this category. Among the other types that originally had a significant market share, Vandell gave special attention to payment-capped and graduated-payment mortgages, and those with buydowns.

Current Experience. Because the rates vary, ARMs provide greater flexibility in terms of yields than fixed-rate mortgages (FRM), but so far they have probably not given FNMA higher yields. There are two reasons: they are typically originated at lower contract rates than FRMs, and since 1981 the general trend of mortgage rates has been down, so that the few ARMs that have already experienced rate adjustments have had their rates reduced.

The latter reason also is relevant to default experience. Vandell did not have disaggregated information from FNMA on defaults and losses by mortgage type, but he felt that the mortgage rate declines in 1983 and 1984 made default on ARMs rather unlikely; certainly there is no reason to expect that ARM defaults would be greater than those for FRMs or that ARMs would be differentially responsible for FNMA's higher default losses. In addition, many of the earlier ARMs had three- to five-year periods before the first rate adjustment, so that mortgagors would not yet have experienced any rate or payment change.

Vandell noted that foreclosure rates were six times higher in 1984 than 1981, but losses from foreclosures were 15 times higher. This implies considerable erosion of equity in the homes, possibly caused by decreasing inflationary expectations; mortgages with deep buy-down discounts were particularly likely to be affected. He did not see that there should be any difference between ARMs and FRMs in this respect, however.

He did offer two possible reasons for higher defaults on ARMs. One concerned only those mortgages with graduated-payment features; private mortgage insurers report much higher default rates on such instruments. The second was broader: adverse selection of ARMs by mortgagors who are more likely to default.

The Default Outlook. The likelihood of significant future losses on ARMs is necessarily more problematical. Vandell attempted to assess the likelihood by utilizing three default models that have previously been developed to analyze default probabilities for FRMs. He simulated the default probabilities for ARMs by substituting the characteristics of ARMs for those of the FRMs, and by making assumptions about the future course of the economy, including changes in property values, real income, and interest rates. Default probabilities are affected by both the characteristics of the mortgage and changes in economic conditions, in the various models. His "worst-case scenario" projects no increase in incomes or property values, but interest rates rising at 2.5 percent per year.

Vandell estimated default probabilities for the seven standardized ARMs currently being purchased by FNMA, of necessity ignoring mortgages acquired through the nonstandard window. He simulated two initial loan-to-value ratios, 0.80 and 0.95, the latter being the highest permitted on mortgages purchased by FNMA.

Vandell simulated both the probabilities of default and the post-default yields on the portfolio of ARMs of each type. He found that defaults would be higher for each ARM than for an FRM under the same scenario. This was true for each model, although the predicted default rates varied substantially between the models. ARMs with interest rate caps were moderately riskier than FRMs, with default rates for the currently popular 5/2 mortgage (maximum five percent interest rate increase over the life of the loan, and two percent annual increase) averaging about 90 percent above a level-payment FRM. Defaults were much greater on graduated-payment ARMs and particularly on those with payment caps; annual defaults were roughly triple those on FRMs. This is not unexpected. Graduated-payment ARMs and those with payment caps have the potential for negative amortization. If the outstanding principal balance reaches 125 percent of the original loan amount, then the loans automatically become fully amortizing. This requires a very large increase in the monthly payment--known as "payment shock." Interest rate-capped ARMs have some potential payment shock also, but it is generally less. The extent of any shock in the early years of these instruments is related to the depth of any original buydown.

Vandell's estimated net yields, however, were much more favorable to ARMs. He found that the loss in yields resulting from defaults was more than offset by the higher yields obtained as a result of the rate adjustments on the full portfolio of ARMs. The instruments with the highest risk tended to have the highest expected yield as well. The 5/2 ARM, one of the safer ones, had a higher expected yield than an FRM by 11 to 14 percent; the riskiest, a graduated-payment ARM, had a higher yield by 15 to 17 percent.

Vandell felt that his methodology overstated the loss from defaults because he assumed zero prepayment, and no recovery of any of the outstanding principal balance in the event of default.

Based on this analysis, Vandell concluded that ARMs had not been uniquely responsible for FNMA's current high default experience. If interest rates should rise rapidly, they would experience higher defaults, but the increased risk is likely to be more than offset by higher yields.

Policy Implications. Vandell suggested that FNMA might consider increasing the size of its Allowance for Loan Loss account, given the increased losses it is now experiencing.

With respect to ARMs specifically, he felt that the negotiated ARM window should be restricted and carefully monitored, because risk sensitivity varied with the characteristics of the mortgage.

He was also concerned about negative amortization and payment shock. Payment-capped mortgages with the potential for a large payment shock should be redesigned to minimize the increase. In addition, the 125-percent ceiling might be varied on a geographic basis, particularly in areas where property values are expected to appreciate less rapidly. He also raised the possibility of geographic diversification of the portfolio in order to ameliorate the consequences of a future economic downturn.

Finally, he favored more conservative underwriting standards on ARMs with buydowns, close monitoring of payment-capped instruments in order to anticipate adverse default trends, and more careful setting of margins and yields to ensure proper compensation for default risk.

Discussion: Modeling Default Risk. The discussion of Vandell's paper concerned two subjects: methodological issues in the modeling of default risk on ARMs, and the likelihood that FNMA will experience problems. Several of the conference participants had conducted research on mortgage default, and methodology occupied much of their attention.

Donald Cunningham, the formal discussant, was one of those who concentrated on the research questions. He started with the assumption that the rational homeowner should default if the value of the mortgage exceeds the value of the house, plus moving costs. This should apply either for ARMs or FRMs. Therefore, any difference in credit risk should arise either from specific differences in the instrument (thus affecting the value of the mortgage) or differences in the characteristics of the borrowers (which could affect moving costs). The value of the house is independent of the mortgage instrument used to finance it.

Cunningham devoted some attention to the details of the three models used by Vandell, concluding that they were generally reasonable. He was concerned, however, about the choice of loan-to-value ratio. The decision to default is based on the ratio existing at the time the decision is made, not the original ratio. In this respect, there is a difference between ARMs and FRMs. For the latter, a rise in interest rates reduces the value of the mortgage; the stream of future payments is discounted back to the present at a higher rate. A fall in interest rates does not have the opposite effect, because homeowners can refinance. For ARMs, the value of the mortgage is relatively unaffected when interest rates change, within the limits imposed by rate caps and adjustment periods. This asymmetry is the major problem in adapting an FRM default model to an ARM. A homeowner with an FRM will delay default when interest ratios rise; one with an ARM will not. Only one of the three models uses a current ratio.

For various reasons, he felt that ARMs were likely to be riskier than Vandell had concluded. Two of the models probably underestimate default rates. The model with the highest predicted rate fails to allow for the asymmetry in the response to changing interest rates. A second model was estimated for the period of the 1970's, when house values were appreciating rapidly, dominating the results, and very few defaults occurred. Vandell therefore had not estimated an upper bound on the loss, as he intended to do.

Cunningham then turned to borrower attributes. He felt that some serve to measure moving costs. The age of the buyer is perhaps the best example: "the young are also the restless and for them moving is cheap, particularly psychic costs. Many are moving for job-related reasons anyway." He cited evidence from a Freddy Mac survey that mobile families do choose ARMs disproportionately.

Vandell agreed that the current market value of the mortgage was the relevant measure, and he expected to incorporate it in future work. He also agreed that the borrower attributes were important, but primarily insofar as they interact with the type of instrument. Some of the key attributes, he felt were unrelated, particularly job loss or divorce.

Chairman Downs asked if Cunningham's hypothetical rational homeowner placed any value on fulfilling a contract. Cunningham said he did not, but under questioning agreed that there are costs associated with defaulting and having to become a renter. He did not think that morality was involved, however. Downs asked if empirical work showed a high incidence of default when it was rational. Van Order mentioned his current empirical work, showing a low default incidence, but felt that further research would be helpful. Vandell described other work of his own in progress, indicating that personal attributes, such as the crisis events that he had mentioned, dominated the characteristics of the mortgage instrument, including the current loan-to-value ratio.

Von Furstenberg argued that the relationship between default and moving costs was not being correctly stated. The decision to move is not strongly influenced by the equity in the home; rather, the decision to default is subordinate to the decision to move. The loss of equity from a default is a cost of moving, but only one of several. The decision to default is therefore more complicated than implied by the previous discussion.

Van Order argued that changing interest rates were relevant to the default decision in two respects. They might affect the value of the mortgage, as Cunningham had pointed out, but they also affect the value of the house. A fixed-rate mortgage is safer, for a lender, because "the state in which interest rates go up is also the state in which house values go down." The decline in house value reinforces the decline in the values of the mortgage, increasing the owner's willingness to stay in the house.

With an ARM, however, the decline in the value of the mortgage does not occur. He felt that the price of the ARM should reflect this difference. Cunningham responded that prices and interest rates had moved up together during the late 1970's, and as a result default rates had been very low then, as he had noted earlier.

ARMs and FNMA. Cunningham gave relatively little attention to the implications of his analysis for the behavior of FNMA. He agreed with Vandell that FNMA should seek geographical diversification in its portfolio, partly because of regional differences in house price appreciation rates, and also because of differences in default and foreclosure laws between states. He also thought that FNMA should ensure that the appraisal reports it receives are truly independent; he suggested that there was some chance that impropriety in some appraisal reports might explain higher defaults on loans with low loan-to-value ratios. Finally, he advocated better monitoring of loans originated by mortgage brokers, where they do not retain the servicing and closer monitoring of ARMs in general, if they do in fact attract more mobile borrowers.

Under questioning from Chairman Downs, Cunningham agreed with Vandell that ARMs are riskier than FRMs, and also that they are probably not responsible for the current high defaults, but might pose a problem in the future.

Buckley distinguished between default risk in general and the risk of loss of FNMA. FNMA is a residual risk-taker; most of the risk is taken by the private mortgage insurance industry. What is relevant is not default risk per se, but expected loss. He felt that FNMA should be encouraged to take the risk of ARMs.

Thomas Hook of FNMA responded in more detail to Vandell's discussion of its behavior. He also agreed that ARMs are inherently riskier than FRMs, but that they are not causing the current default situation, attributing it instead to FRMs originated in 1981 and 1982, particularly from the states of California, Florida, Michigan and Texas. The California experience probably reflects both deterioration in property value and the fact that mortgage default does not appear on a person's credit report, under California law. The Michigan defaults have resulted from the recession. Overall, loan losses apparently peaked in the second quarter of 1984; the fourth quarter losses were $17.1 million, down from $23.4 million in the third quarter.

In response to a reported quote that ARMs accounted for 25 percent of recent foreclosures, Hook and Keith Haffner of FNMA stated that this figure was too high. The estimate was apparently based on a sample that may not have been appropriate for this purpose.

Hook stated that FNMA has changed its loss reserve accounting procedures, increasing the reserves to allow for the probability

of higher defaults on the ARMs it is now buying. He pointed out that foreclosure losses do not affect FNMA's earnings in the year that they occur, but only the loss reserve. Chairman Downs argued that an increase in the loss reserve would affect earnings; Hook responded that the increase occurred at the time the mortgage was purchased--"the timing's different."

FNMA bought about five to six percent of ARMs originated in 1984--about $6 billion out of a total market of around $100 billion. It does not buy ARMs with teaser rates or deep buydowns, leaving them for savings and loan associations. It considers itself to be purchasing "rather conservative ARMs."

Hook felt that the negative amortization problem stressed by Vandell is disappearing, with the trend to interest rate-capped ARMs. Vandell argued that the problem still exists for graduated payment ARMs. Hook disagreed. The negative amortization "is nowhere near" the 125-percent ceiling. The payment capped ARMs appear to be much like FRMs. Further, FNMA requires lenders to advise the borrower before closing as to the effect that the payment cap may have on his outstanding principal balance if interest rates rise. The lender is also required to warn the homeowner if the 125-percent ceiling is going to be reached during the current adjustment period, before the owner is actually confronted with the problem. Vandell's worst-case scenario is "pretty stiff"; "a lot of things would happen" before a 2.5-percent interest rate increase every year came to pass and created any payment shock, assuming the payment increase actually came as a shock. (Vandell responded that a 2.5 percent increase for three years actually occurred beginning in 1977 and that was his worst-case scenario.)

As a final point on payment shock, Hook noted that borrowers have not always elected payment caps, where available; Vandell's analysis assumed that they do, as part of the worst-case scenario.

Hook stated that FNMA does not have stricter underwriting standards on ARMs than on FRMs because it believes that ARMs help the first-time homebuyer, which is part of FNMA's mission. The higher expected yield also enables FNMA to maintain this policy.

FNMA does limit payment-to-income ratios on graduated-payment ARMs, as Vandell recommended; these mortgages are more risky when interest rates are stable or falling than when they are rising; in a rising rate environment, borrowers expect rates to decline in the future. Mortgagors with ARMs generally have lower loan-to-value ratios, as well as lower payment-to-income ratios. Hook inferred that ARM borrowers are behaving rationally.

Commenting on von Furstenberg's point, Hook noted that ARMs are assumable while FRMs are not. Assumability makes it easier for the owner to sell his home, reducing the likelihood of default as a side effect of a decision to move.

On the issue of geographic diversification and pricing, he said that there is some tendency for ARMs to be coming from the Sun Belt from Florida to California, where first-time homebuyers are concentrated. But it is impractical for FNMA to buy ARMs from different states at different discounts.

Vandell asked about the size of the nonstandard loan window. Haffner termed it "significant" because FNMA tends to buy portfolios including non-standard loans. "At certain periods of time, our purchases through the negotiated transactions window represent the majority of purchases of ARMs." Hook added that originally interest-rate-capped ARMs were nonstandard before FNMA developed a purchase program for these mortgages, and that the negotiated window "takes the little variances," such as small differences in the maximum life-of-loan interest rate cap. Haffner asserted that non-standard loans are not riskier than those purchased under the specific programs; the same underwriting guidelines are followed. Also, for some nonstandard loans, FNMA may elect to share some of the risk with the lender through a subordinated participation or a repurchase agreement.

As a general comment, Hook complimented Vandell for his accuracy in describing the FNMA ARM programs.

CONCLUSION

The Broad Policy Issues: A Summation

Much of the discussion of public policy took the form of a recurring debate between the representatives of FNMA and some industry groups, and the independent academic analysts. The former argued that FNMA served the public purpose of providing more housing by channeling credit to the mortgage market. The latter gave little weight to this goal and stressed the costs of achieving it. The costs were generally classified into two categories. First, FNMA exposes the government to explicit risk, because of its line of credit with the Treasury, and implicit and potentially much greater risk because of the government's moral obligation to holders of FNMA paper, extending beyond the limit of the line of the credit. More broadly, there are the social costs arising from the resource misallocation toward housing and away from other sectors of the economy.

But there was general agreement that the ultimate decision about the value of FNMA is and ought to be a political one. For example, most of the economists who argued that FNMA creates social costs went on to state that the decision to incur those social costs was clearly a political choice. But they wanted the costs to be stated clearly and made known to policymakers. As Kaufman stated the point, "There are resource costs that should be recognized, and if they are recognized and the Congress says, 'fine, those should be paid,' that's all right with me." He

viewed his responsibility as pointing out the cost-benefit calculus to policymakers, leaving it for society to decide whether the benefits were large enough to justify the costs.

Kane took a similar position. He argued that the cost of the federal guarantee to FNMA should be made explicit to facilitate better public policy. He thought public officials had not been aware of the consequences of volatile interest rates in increasing the size of the implicit guarantee given to FNMA. He accepted the policymaker's right to make the same decision again, even in the light of better information about its cost.

Howard agreed that the decision was a political one; if society does not want to help housing, then it should make the decision to "unwind" FNMA and other institutions to encourage housing.

Matthews argued that the costs were not news to policymakers: "We have not discovered them today; we've known about them before. And it was intentional." FNMA was expected to encounter some risk and involve some costs, "and we knew that going in." The costs have not just been discovered. If Congress now decides not to continue incurring the cost, "that's fine--that's a policy question--but in 1968 Congress did want to channel some more money into housing."

But both Kaufman and Kane felt that the costs were higher, and the benefits lower, than Congress had originally thought they would be. Kane hoped that increased understanding of the costs would result in a different policy.

Kaufman felt that his results, in combination with other theoretical and empirical evidence, raise the question of whether the social benefits resulting from the existence of FNMA justify the costs. There does not appear to be any longer a countercyclical impact from its activities, to balance against the significant social costs.

Von Furstenberg went further and argued that FNMA "cannot and has not done much good" in contributing to stability of the housing cycle.

Chairman Downs suggested accepting for the purposes of argument that FNMA had accomplished some allocation of funds to housing, and that it was necessary to incur the social costs to do so. The question now is, "from now on, is it necessary to have FNMA operate to create similar channeling? Don't Freddy Mac and GNMA perform the same function?" Even though they do not hold portfolios, they are intermediaries that create bond-like instruments and thereby transfer money from the bond market into the mortgage market--not exactly in the same way as FNMA, but in a similar way.

Chairman Downs also asked Kaufman and von Furstenberg if they felt that FNMA should be privatized, and if so, "would that not create an unlevel playing field, as long as federal deposit insurance still exists?" Both felt FNMA should be privatized, but that federal deposit insurance served a useful public purpose. Von Furstenberg took the position that the misallocation resulting from deposit insurance is rather small, and the market imperfections it removes are rather large.

Howard argued that if FNMA were privatized, it would no longer be able to be in "the portfolio business" of buying a mortgage and selling debt against it, and would have a much smaller volume of mortgage-backed securities. With the guarantee, FNMA is able to transform a grade Baa mortgage into a federal agency credit, which is much more highly valued in the market. It can make money by doing so and increase the size of the mortgage market. Without the federal guarantee, it would simply turn a Baa mortgage into a Baa credit, "and I don't think many people would want that service." He hazarded a guess that FNMA might be able to buy $4 billion to $5 billion worth of mortgages on this basis, rather than $40 billion.

There was some discussion to the effect that FNMA's guarantee is not unique. Downs stated that there are "enormous implicit guarantees in all parts of the government" that are not regarded as similar to cash outlays. Dolbeare agreed and offered examples of federal guarantees to purely private firms. Kane said he had no special reason for singling out FNMA, and generally favored eliminating government guarantees. Kane added that "none are so blind as those who will not see, and we are determined not to see all the guarantees" provided by the federal government. There is in effect an insurance holding company operating as part of the federal government, growing out of an unrealistic attitude toward government's ability to provide help. Howard also stressed that FNMA is not unique. "I've got on my shelves reams of budget books that list all of the direct and indirect guarantees by government for its entities in a number of different businesses."

Kaufman argued that federal guarantee programs have proliferated because the implicit costs have not been considered by policymakers. As a result, "they have been willy-nillied into place, and now all of a sudden we have somewhere between $300 and $500 billion in these potential liabilities, and perhaps more." The problem is not unique to FNMA. He recalled participating in a Congressional Budget Office conference a few years ago, analyzing the costs of government guarantees in general, without any particular emphasis on FNMA.

The Conference: A Summary

Late in the day, Chairman Downs offered his own rapid summary of the conference, taking each paper and discussion in turn. A summary of his summary follows.

Kaufman said that FNMA was generally believed to have had some countercyclical impact until the 1980's, but his research shows that deregulation has reduced this impact. Kaufman questioned whether FNMA still serves a public purpose. Then von Furstenberg "in his mild unassuming way" argued that FNMA in effect hurts the poor by driving up housing prices without providing offsetting benefits to them, and that it misallocates resources to housing that would be more productive elsewhere. He wanted to privatize FNMA, or alternatively to have more and stronger oversight by federal agencies, if it continues in its present form in the present deregulated financial environment. FNMA is in a different position from savings institutions, in the opinions of both Kaufman and von Furstenberg. (Downs chose to pass over the FNMA response to this paper.)

Vandell argued that ARMs were not particularly responsible for FNMA's rapidly growing mortgage defaults and losses. In the future, they would be riskier than fixed-rate mortgages, but would probably have high enough yields to offset the risk. Both Cunningham and FNMA agreed with his conclusion.

Clarke "suffered from the fact that everyone knew what he was going to conclude, which is that FNMA has a large negative gap." He measured the gap and concluded that FNMA has been trying to do something about its financial problems. Kane then argued that FNMA costs the Treasury a lot of money, and the size of its subsidy is not controlled by anyone except FNMA itself. HUD is completely ineffective as a regulator. Kane's measure of the subsidy showed that it has recently become much greater. The measurement technique was controversial. Kane suggested several policy approaches, the most important being (1) to charge FNMA each year for the increase in the value of the subsidy, in whole or in part, (2) to exercise more federal control over FNMA, and (3) to abolish it and pay the cost of acquiring the portfolio and liquidating it. FNMA did not agree that it was irresponsibly expanding its portfolio, but did agree that the value of the guarantee was significant; without it, FNMA would be out of business.

Clemmer said that FNMA had performed some services to low- and moderate-income buyers in the past, particularly in the Section 235 and 236 programs, but that it isn't doing much now. Dolbeare agreed, but added the hope that FNMA could do more, without offering concrete suggestions--she mentioned several areas to investigate but noted that the fundamental problem is the need for subsidy, while the federal government is getting out of the subsidy business. Margulies said that FNMA couldn't do anything effectively except reallocate credit to housing markets, which is valuable; other activities, including directing credit to low- and moderate-income homebuyers, it was incompetent to do.

Downs described his summary as "pretty miserable," but there was not much dissent from it during the remainder of the conference.

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FNMA And The Housing Cycle: Its Recent Contribution And Its Future Role In A Deregulated Environment

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I. INTRODUCTION*

The role that FNMA has played in the mortgage market over the housing and mortgage credit cycle has often been the subject of controversy. Supporters of FNMA have maintained that it has been a crucial factor in moderating housing and mortgage credit cycles since its privatization in 1968. Its critics have suggested that its contribution has been negligible and it has behaved simply as a financial intermediary, using its status as a federally-sponsored agency to its advantage. This criticism has appeared more frequently in recent years as financial innovation in the mortgage market and deposit deregulation have broadened the sources of funds available for mortgage lending, and as FNMA activity has increasingly appeared to resemble that of purely private financial institutions in the mortgage market.

The purpose of this paper is to analyze both theoretically and econometrically the role that FNMA played over the last cycle and its likely future role in an environment of financial deregulation and financial innovation. Deregulation and financial innovation have affected the credit markets, financial institutions, and the mortgage market.

It has been argued by FNMA repeatedly over the last fifteen years that it fulfills a crucial public purpose by providing mortgage credit countercyclically thus moderating housing cycles by augmenting mortgage funds availability. There have been numerous academic studies regarding the role of FNMA with respect to its countercyclical activity (e.g., Silber, 1973; Kaufman, 1977, 1981a; Hendershott and Villani, 1974, 1977; Jaffee and Rosen, 1978).[1] These researchers have generally concluded that FNMA has behaved somewhat countercyclically in the past. Jaffee and Rosen emphasize the positive contribution that FNMA has made on timing, arguing that FNMA has provided needed assistance to the mortgage market at time of need, but that its assistance has generally been reversed after the passage of time. They argue, however, that the timing has been important in moderating the housing and mortgage credit cycle. Swan (1973) also emphasizes the timing element in FNMA's assistance. Silber, Hendershott and Villani, and Kaufman have all treated FNMA as endogenous to the mortgage market to varying degrees. Kaufman has pointed out

*I wish to thank Mark Kinsey for very able research assistance on the empirical section of this paper.

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[1]In addition, there have been government studies and hearings concerning FNMA, as well as recommendations by commissions that impact upon FNMA. See e.g., The President's Commission on Housing (1982) and the excellent summary and discussion by Seiders (1982). See also the special issue of the AREUEA Journal, edited by Kent Colton, David F. Seiders, and John A. Tuccillo (1983) especially the papers by Colton, Seiders, and Grebler.

that this endogeneity did result in countercyclical assistance to the market but that FNMA did not aggressively attempt to moderate that cycle.

All the work referred to above was done well before the last cyclical downswing in housing and before the bulk of the deregulation and innovation process had hit traditional mortgage lenders as well as the mortgage market itself. Thus, these previous results which find some countercyclical role for FNMA may no longer be relevant. Examining the latest cycle would provide more current evidence and this examination is attempted in this paper.[2]

Linked with the issue of FNMA's countercyclical behavior has been the question of the net affect of this behavior on the mortgage market. FNMA, until it moved into the MBS market in the last couple of years, had bought mortgages solely for its own portfolio and financed the bulk of its purchases by borrowing in the money and capital markets. Under the previous regulatory structure dominated by regulation Q ceilings, to the extent that FNMA money and capital market financing put upward pressure on interest rates, one would have expected an induced outflow from traditional mortgage lending institutions into the open market, thus reducing the net affect of FNMA activity. Indeed in the Jaffee-Rosen model (1978), the timing effect of FNMA activity is in part due to the time this induced disintermediation takes to occur. With the elimination of regulation Q ceilings and the expanded asset power of traditional mortgage lenders, it is unclear whether FNMA actions can now even be expected to have transitory effects on the mortgage market, even if FNMA desires to behave countercyclically.

Furthermore, whether FNMA would behave countercyclically in this new environment is also at issue. FNMA is clearly very conscious of its private status and its obligations to its shareholders. The Secondary Mortgage Market Enhancement Act of 1984 further expands private representation on the FNMA board and it is arguable that FNMA during the last cycle attempted many things that were in the best interest of minimizing its losses from the negative spread on the bulk of its portfolio. Fee income from MBS and its movement into the purchase of higher yielding second mortgages, which arguably do not have anything to do with the provision of mortgage credit, are but two examples of apparent attempts to improve its profitability.

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[2]It should be noted that Grebler (1975, 1980) has always raised the issue of whether FNMA could be considered truly countercyclical in that its sales were always small during expansions in housing and mortgage credit. One would expect symmetry from a truly countercyclical policy agency.

It is necessary in this paper to examine the private versus public purpose of FNMA in the future to ascertain whether its federal agency status is appropriate. It benefits greatly in financing from its status as a federally sponsored agency. Its debt is viewed as carrying the moral obligation of the federal government in case of default and it has an explicit direct guarantee in the form of its line of credit to the Treasury. Such federal government exposure can only be justified if FNMA does fulfill a public purpose in aiding the mortgage and housing markets. This will also be explored below as will the implications for the financing of economic activity of the primacy that the federal government has given to housing in its policies, of which FNMA is but one example.

Turning to the structure of this paper, the next section presents a brief review of the literature on FNMA's role prior to the last cycle and lays the foundation for the theoretical discussion and model formulated in Section 3. Section 4 presents some econometric results on the impact of FNMA generated over the last cycle. The results are based on ordinary least squares estimation techniques as well as vector autoregression (VAR) models. The former show little role for FNMA over the last cycle while the latter VAR estimation and variance decomposition experiments confirm this limited role and the endogeneity of FNMA in the market. Section 5 then examines, using the implications of the theoretical model as well as the empirical results, the likely future role of FNMA in an environment characterized by deregulated financial intermediaries and financial markets and mortgage market innovation. Finally Section 6 contains some brief concluding remarks.

II. PREVIOUS STUDIES

This section highlights the findings of the past academic literature on FNMA. While not an exhaustive survey of all the work that has been done on FNMA, it does give the necessary background for the analysis done later in this paper.

There have been several academic studies of FNMA during the last decade. Early literature on FNMA treated it as an exogenous policy instrument (e.g., Brady, 1970; Fair, 1973; Huang, 1969). Silber (1973) treated FNMA (and the FHLB) as endogenous by examining objective functions for both agencies that were identical, but his analysis with respect to FNMA focused exclusively on FNMA purchases in the mortgage market, something that Kaufman (1977) argued was inappropriate. FNMA, it was argued in Kaufman, decided on its commitment activity, with purchases then dependent on the decisions of commitment holder to deliver.

Jaffee and Rosen (1978) perhaps came to the most favorable conclusion of the 1970s academic work regarding FNMA's countercyclical behavior. Using a structural model of the housing and mortgage market, they argued that FNMA provided most of its

assistance through its commitment activities. When these commitments were taken down as purchases by FNMA--and thus FNMA had to go to the market for financing--the upward pressure on rates that ensued reduced, and in equilibrium eliminated, the impact of FNMA actions. However, they argued that the interim assistance was critical in moderating the cycle. They argued that the Arcelus-Meltzer (1973) contention that agencies have essentially no net effect on the housing and mortgage markets is not accurate nor is it accurate to take at face value FNMA and its supporters' contention that FNMA is instrumental in generating mortgage credit assistance to a significant degree. They stated:

> In our view, the fact lies between these extremes, and depends critically on the relevant time span. Expirical evidence now has been accumulated showing that the agencies, in fact, have essentially no effect on mortgage and housing markets over extended periods; beyond say a year, private sector reactions do fully offset the intervention of the agencies. On the other hand, available quarterly econometric models have been at least suggestive that the agencies do have influence over the timing of housing starts in the short-run, say for periods up to a year. If this is true, then, with careful timing of their intervention, the agencies may indeed be able to stabilize short-run fluctuations in the housing and mortgage markets. (pp. 933-934)[3]

Returning to the issue of endogeneity, Hendershott and Villani (1974, 1977) made FNMA behavior partially endogenous in their work and concluded that the assistance that FNMA provides has been significant. Hendershott and Villani also find that FNMA's assistance has long-run effects unlike most other studies.[4] Jaffee (1974) has argued that FNMA was an "exogenous policy instrument" in its actions. However the bulk of evidence and treatment in the academic literature does suggest endogeneity.

Much of the Jaffee-Rosen work as well as work by Rosen himself (1977) uses a model that allows for credit rationing to work. This credit rationing occurs because of regulation Q ceilings. Thus, it may very well be that their analysis is less relevant in a deregulated environment as are their conclusions. For example Rosen concludes:

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[3]Craig Swan (1973) has also emphasized the timing of FNMA assistance.

[4]Swan (1974) in theoretical work suggests long-run effects as well but does no empirical work in the context of the theoretical model to test this hypothesis.

> First, FNMA commitment and purchase activity has a strong positive effect on the housing and mortgage market. During periods of credit rationing in the mortgage market this effect is especially, pronounced . . . During non-rationing periods the net effectiveness is substantially lower . . . Also in the rationing period, the impact of FNMA comes much sooner, with half of the effect coming in the first four months. In the non-rationing period only 10% of the effect comes in the first four months. FNMA's impact on the mortgage market follows a comparable pattern. Its activities have substantially greater effect during rationing than during non-rationing periods. (pp. 28-29)

This quotation raises the issue of whether in the absence of regulation from which the rationing problem arose, there is a major role for FNMA even without the innovations that have occurred. We will return to this later.

There are, of course, other issues that have been investigated in previous work that are still relevant. FNMA has had an unusual dual purpose since its privatization. It was charged with providing mortgage market assistance and at the same time it must satisfy its private stockholders (and its charter) by maintaining some degree of profitability. These twin goals can conflict, particularly when interest rates are high. Presumably when the mortgage market needed assistance FNMA had subsumed its profit objective to its mortgage assistance objective in the past. However, Kaufman (1981a) has pointed out, referring to the results of the FMS auctions:[5]

> Presumably in time of need, FNMA subsumes the profit objective to the mortgage objective. Yet this is not always clear to the observer. At times there appears to be a lack of aggressiveness (judged by the percentage of offers it accepts) by FNMA during periods when credit conditions are "tight" and considerable mortgage market assistance seems necessary. The concern for profitability may be a factor in this behavior. . . FNMA must go to the market for funds--it may not be able to make decisions solely on the basis of what it believes is the right course to follow for stabilization. As a result even at auctions that take place during periods of considerable stringency in the market, FNMA rarely takes even a majority of those mortgages offered to it for commitment, although the

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[5]FMS auctions were discontinued in early 1983. See Leigh (1983) for a very useful discussion and chronology of FNMA programs and of federal housing finance programs in general.

volume of offers does increase and hence the absolute amount of FNMA commitments usually does rise. (p. 147)

Kaufman goes on to report results of testing a model of FNMA that had demonstrated its endogeneity in the market for structural stability. The Brown-Durbin-Evans (1975) procedure was utilized and failed to find any significant difference between periods of credit stringency and non-stringency in FNMA behavior. This was confirmed by a dummy variable procedure as well. He concludes:

> The evidence provided above indicates that FNMA does not appear to attempt aggressively to redirect the market along a more desired path. This does not mean that its assistance is not countercyclical or substantial. The size of its portfolio alone guarantees the latter. Rather it implies that if FNMA is regarded as undertaking aggressive stabilization policy in the mortgage market such as the Federal Reserve does in the money markets, FNMA's role . . . will be misunderstood. (p. 151)

The context of all the above work cited is the period up to about 1978 when there appeared to be little controversy among policymakers and FNMA officials that FNMA indeed was playing a countercyclical role. Yet the academic work indicates that there was substantial doubt about the extent of that countercyclical activity.

As noted above, a further topic of discussion in the literature was the net impact of FNMA when the fact that it financed in the open market was taken into account. Swan calculated that the net assistance to the mortgage market from FNMA activity was small. Jaffee and Rosen (1978) simulated FNMA activity and showed that FNMA activity did put upward pressure on open market rates, but concluded that FNMA's role in the short run was still considerably positive. They found that Treasury bill rates peaked at about 66 basis points higher as a result of FNMA financing while the 3-5 year bond was up about 26 basis points. They concluded that since this financing takes place 4 to 12 months after commitments are made it does not negate the positive impact of FNMA activity. They conclude:

> This paper has shown that the federal mortgage agencies have a substantial short-term impact on the level of housing and mortgage market activity. This countercyclical effect arises primarily because of their ability to issue commitments and so positively influence the mortgage and housing markets in the short term while only borrowing when a mortgage purchase is made --four to twelve months in the future. Thus, the short-term timing of commitments, purchases, and borrowing crucially influences the effectiveness of the

agencies. In addition, during periods of credit rationing the agencies are especially effective at stimulating housing and mortgage activity. (emphasis mine, pp. 944-945)

Kaufman (1977) also addressed the issue of FNMA financing, concluding in his model that FNMA actions raised agency rates during credit stringent periods and, through term structure relations, all rates. In the period that he investigated, 1969-1974, governed as it was by regulation Q ceilings, the induced rise in open market rates suggested disintermediation from traditional mortgage lenders, reducing the amount of FNMA assistance.

On balance then, previous research conducted during a period of deposit interest rate controls as well as a considerable regulatory structure and before the period of substantial financial innovation, suggested that FNMA's countercyclical role was modest though significant, particularly if the timing of its actions was considered. The issue that we now turn to is whether in a period of deregulation, including the elimination of regulation Q ceilings and innovation in financial intermediation and in the mortgage market, FNMA's countercyclical behavior continued.[6]

III. THEORETICAL CONSIDERATIONS

For most of FNMA's existence, its activities were limited to purchasing mortgages for its portfolio. Occasionally it sold mortgages out of portfolio but sales were quite modest (see Grebler, 1975, 1980). FNMA began its MBS program in 1982 and also began buying second mortgages about that time. However, FNMA has argued that it is its portfolio purchases that have

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[6]There is some dissent concerning whether the timing of FNMA commitment activity in the past indicated a public purpose rather than a private profit maximization purpose. In a study prepared for the Committee on Banking, Housing, and Urban Affairs of the U.S. Senate, Farb and Bendt argue that even the timing of FNMA commitments relative to market conditions, i.e., its countercyclical behavior is motivated by its private concerns, i.e., stockholder interest which just happened to coincide with public purpose. They argue that its increased commitments during periods of credit stringency would be an appropriate way for it to increase its earnings by adding higher yielding mortgages in greater volume even at diminished spreads. The implication is if FNMA found situations where its private stockholder welfare maximization conflicted with its public purpose, it would put its private goals first. This was written in 1976 before most of the recent developments that have led to this conference and surrounding debate. (Farb and Bendt, 1976, especially pp. 48-55).

primarily been its route to assisting the mortgage market, attracting non-traditional mortgage purchasers to its notes and debentures while its MBS activity has tended to attract traditional mortgage lenders (FNMA, 1984, p. 18). Later in the section we will return to MBS and second mortgages but for now we restrict our analysis exclusively to FNMA portfolio purchases.

Figure 1 depicts in mortgage interest rate-mortgage credit space, the supply and demand for mortgages. We begin in equilibrium with the supply and demand curves intersecting at R_d mortgage rate and Q_d mortgage credit. The expected effect of FNMA actions is to shift the supply curve to S_1, increasing the supply of mortgage credit and lowering the mortgage rate. Assuming that the demand for housing is sensitive to the mortgage rate, additional housing starts occur. However, FNMA must finance its purchases in the open market when commitments are taken down. This suggests that in Figure 2, the demand for credit shifts from D_0 to D_1. The open market interest rate rises. To the extent that deposit liabilities at traditional mortgage lenders are sensitive to open market interest rates, the liabilites of these lenders are reduced, draining credit from the mortgage market. The reduction in deposit liabilities at traditional mortgage lenders (and the behavior of potential mortgage lenders who have portfolio flexibility) shifts the supply curve in Figure 1 perhaps back to S_0, perhaps further.[7] The result would depend upon the interest elasticity of deposit liabilities and the adjustment period. In equilibrium there may be no net effect on mortgage credit.

The analysis above is fairly conventional and underlies the discussion of Swan (1973, 1974), Grebler (1975, 1980), Kaufman (1977), and others on the reduction of the gross assistance to the mortgage market of FNMA activity. However, it is strictly applicable due to the existence of deposit rate regulation and limited asset choice for financial intermediaries. The induced disintermediation occurs as a result of the inability of financial institutions to pay market rates of interest. But this is no longer the case.

Traditional mortgage lenders can now pay market rates and they are also not limited in their asset choices to the extent they once were. What this suggests is a market that may adjust much more quickly than in the past. It is quite possible that the immediate result of a rise in open market interest rates in response to FNMA financing of its mortgage purchases may not affect deposits as financial intermediaries raised their deposit

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[7]See Jaffee and Rosen for a similar analysis. However, they argue that the lag between the time of the commitment which they interpret as the increase in the supply of mortgage credit and the time of the financing results in a short-term impact from FNMA activity. This may no longer be the case or the lag may be less (see below).

Figure 1

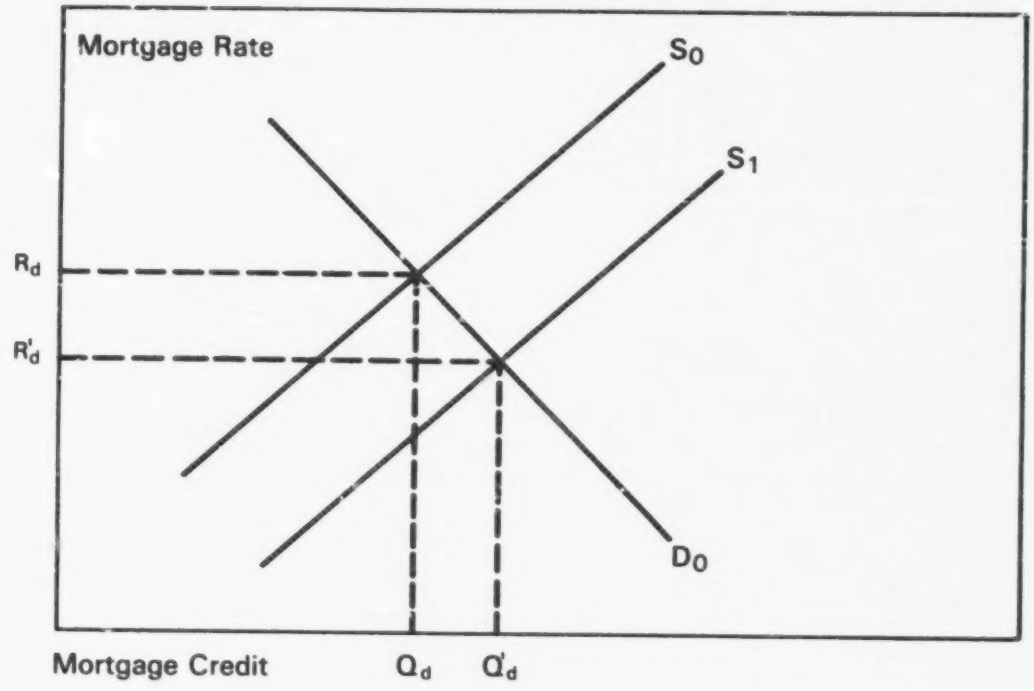
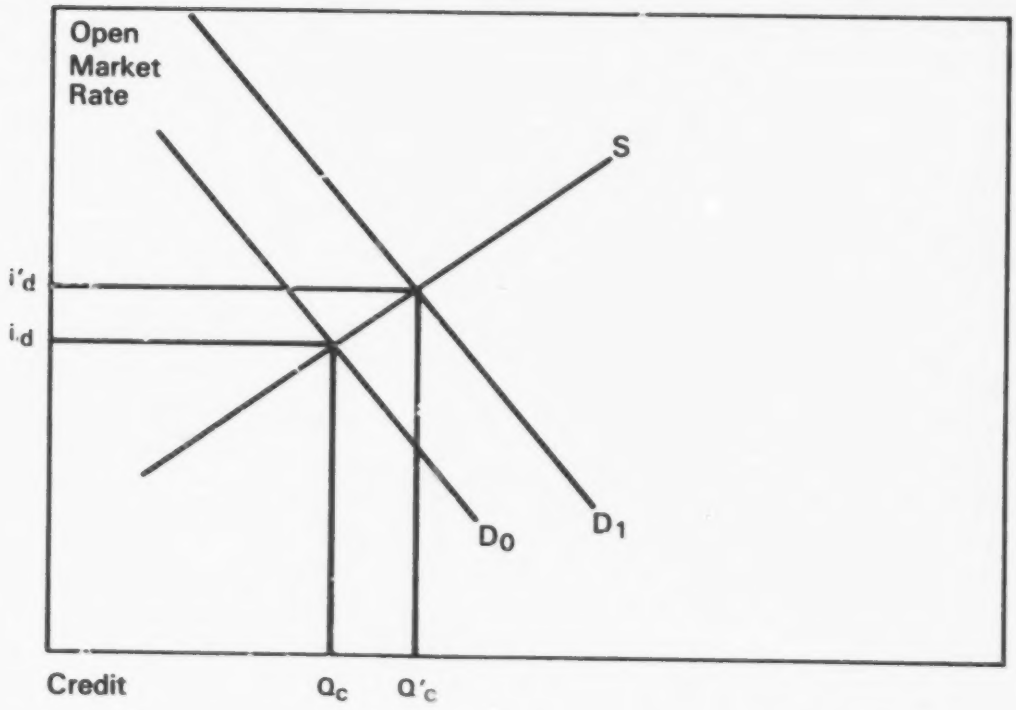


Figure 2



rates but it would affect the portfolio choices of financial institutions as they attempted to earn positive spreads or reduce negative spreads. The result would be the same, namely a diminution of the impact of FNMA activity on the mortgage market but it would occur much quicker. This would wipe out at least a portion of the net positive effect through timing that Jaffee and Rosen find.

The discussion above raises another important issue in this context. The reason for the existence of FNMA itself is presumably to implement a housing policy that the government finds attractive. However, there are serious implications from this policy itself for resource allocation that need to be addressed.

FNMA, if it is effective, works by attracting funds to the mortgage market that would not otherwise be available. FNMA itself argues (FNMA, 1984) that through its note and debenture sales, financial institutions and other credit market participants who would not purchase mortgages, do buy the debt securities. Since FNMA in turn utilizes the proceeds of its debt issues to purchase mortgages, it indirectly taps non-mortgage market sources for its mortgage market activities. (FNMA's own analysis of ownership of MBS (1984, p.18) suggests that this is not true for MBS programs.) If this argument is accurate, then it implies a straightforward reallocation of resources to the mortgage market and away from potentially more productive sections of the economy as would be judged by the market left to its own devices. This conclusion is reached by the fact that as a federally sponsored agency, FNMA has preferential position in the financial markets and will achieve all the financing it wishes to once it has determined its needs. Private, non-government sponsored debt will be crowded out through price and potentially through availability as well.

The following simple model and accompanying diagram makes this clear. Government financing is governed by its budget constraint as shown in equation (1)

$$(1)\quad G + T = t + \Delta m + \Delta B_g$$

where:

G = government spending

T = transfers

t = tax revenue

Δm = change in the money supply

ΔB_g = bonds issued to finance government spending

By assuming T=t, since taxes and transfers are not important in the analysis, and Δm zero, then

(1a) $G = \Delta B_g$

that is all expenditures are bond financed.

FNMA's borrowing decision is determined by the amount of the takedowns of its commitments. It too, like the government, is not sensitive to the rate at which it borrows to finance its takedowns, i.e., it must finance, though of course the rate affects its commitment decisions. Thus

(2) FBORR = TD

where:

FBORR = FNMA borrowing in the open market

TD = FNMA takedowns of its commitments

Like the government then FNMA borrowing in the short run is completely interest inelastic.[8]

Private borrowing is interest elastic dependent on the interest rate and the external financing needs of business

(3) $B_c = f(r,D)$

where:

r = interest rate

D = external financing needs (See Bosworth, 1971; Kaufman, 1976)

Figure 3 depicts the results of this model. Let us suppose that in the absence of its agency status, a company with the type of leverage ratio that FNMA has would be excluded altogether from the financial markets. This results in clearly a polar case but is useful for analysis. Then with FNMA borrowing the demand for funds is B_d and private borrowing is B_{c1} and without FNMA it is B_{c2}. Then the difference between B_{c2} and B_{c1} is the extent that FNMA activity crowds out private borrowing. Assuming that $B_{c2}-B_{c1}$ of private borrowing would take place by the assumed removal of FNMA from the market--again a polar case--then the market would have evaluated that borrowing is more economically viable and therefore presumably a more efficient use of resources. Hence there is a societal resource allocation

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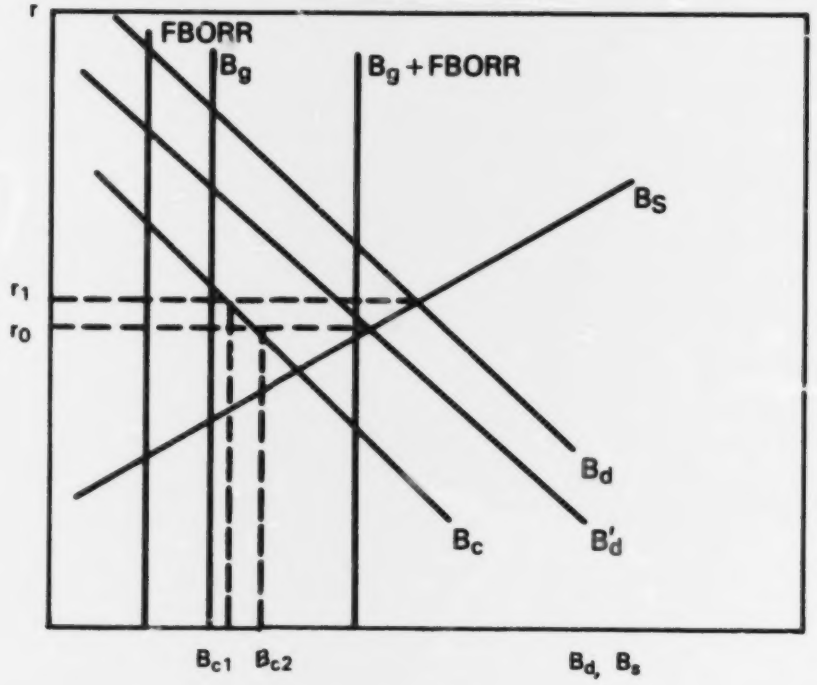
[8]Similar analysis holds for all government sponsored borrowing as well as government guaranteed borrowing in general. However, since we are focusing on FNMA, we abstract from these additional borrowers. This does not change the qualitative result. For more on this type of model see Kaufman (1981b).

cost to FNMA financing activity that should always be recognized. How much that cost is depends entirely on the elasticities of the supply of funds and private demand for funds. Nevertheless it is there. This result therefore shows that the costs, which society may wish to pay in the interest of some higher social welfare function, go beyond the explicit line of credit available at the Treasury to FNMA and the implicit moral obligation of the government.

Turning to other theoretical issues, the entrance of FNMA into the MBS market has no doubt increased the liquidity of this market considerably. FNMA has achieved a substantial position in a very short time. While it has always been hoped that MBS would attract funds that would not normally flow into mortgages, FNMA's analysis itself shows that the major purchases of MBS are traditional mortgage lending institutions. Life insurance company and pension fund participation has been rather disappointing (see FNMA, 1984). CMOs introduced by Freddie Mac have expanded the market considerably. However, private firms have also been active and recently the international dimension to MBS issued by private firms has been expanded by access to the Eurobond market. Thus far, therefore, it appears that Freddie Mac and the private sector as a whole have been more successful in tapping non-traditional mortgage lenders for mortgage market funds through MBS type offerings than has FNMA.

Figure 3



The question is why did FNMA enter this market? The market was growing without it and FNMA itself has argued that its mortgage assistance effort was really accomplished through its portfolio purchase program. The clear speculation is that it did so to increase its fee income and hence its profitability, acceptable for a purely private organization. That FNMA is not a purely private organization and enjoys substantial benefits from its agency status suggest however that there should be more to its entry than fee income. FNMA has increased the liquidity in the market but whether its efforts would have been better directed over the last few years to additional portfolio purchases in serving its public purpose we leave to the empirical section.

Finally, it is necessary to consider FNMA's entry into the purchase of second mortgages. This also generates fee income and generally higher returns than first mortgages and hence is more profitable from a spread standpoint. However, it is arguable that virtually no new housing is generated out of second mortgage loans. Thus, it is curious that FNMA would enter this market except from a profitability standpoint. The use of its government sponsored status for the financing of consumer durables rather than additional housing starts is hard to justify.[9]

With all that has happened over the last few years, whether FNMA is playing a countercyclical and important role in the housing and mortgage markets may be detectable from its impact over the last cycle. The results may also suggest its likely future role in this new environment. Therefore, we now turn to an econometric examination of FNMA's impact over the last cycle.

IV. ECONOMETRIC INVESTIGATION

The major task of this section is to present the results of an econometric investigation into FNMA behavior during the most recent mortgage and housing cycle. There are several questions that the econometric investigation is designed to address. Did FNMA have a significant impact upon housing, mortgage credit, and the mortgage interest rate during this period? Was FNMA an exogenous driving force behind movements in these variables? Did its financing serve to put upward pressure on open market interest rates potentially reducing any gross impact from its activities?

It has been suggested in both Sections II and III that previous work had on balance concluded that FNMA had behaved countercyclically during the 1970s although not aggressively.

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[9]In fairness, FNMA has argued that only by maintaining its financial health, its stockholder capital base, and its profitability, can it continue to provide assistance to the mortgage market.

Further, the Jaffee-Rosen (1978) results suggested that the strength of FNMA's impact was short run, reduced by the impact of its financing and, after about a year, eliminated, though Hendershott and Villani (1974, 1977) had found longer term effects. Kaufman's (1981a) results suggested that while FNMA behavior was countercyclical, its endogeneity suggested a rather non-aggressive response to mortgage and housing downturns. In fact, Kaufman conducting structural stability tests found that FNMA did not behave significantly differently over the cycle but that its endogenous responses to mortgage conditions led it to its apparent countercyclical behavior. The econometric work to be reported below examines whether this behavior changed over the last cycle.

The major econometric results to be reported below have been generated utilizing VAR procedures. In addition conventional ordinary least squares (OLS) models utilizing polynomial distributed lag procedures were also estimated. Since VAR estimation may not be familiar to all readers, it is useful to briefly explain what it is before turning to the models and the results.[10]

VAR estimation is a tool designed to summarize the relationship among a group of economic time series at various time lags. It is not a single regression equation but rather a system of regression equations. There is one equation for each variable in the system. Once the variables for the system are chosen, simple OLS regressions are run. The current values of the system variables are regressed on the lagged values (the length of the lag is chosen in advance) of all the variables that compose the system, including the lags on the dependent variable (Offenbacher, Porter, and McKelvey, 1982). While a causal model is not posited explicitly, the VAR technique does allow one to draw inferences regarding "causation" or exogeneity. This will be discussed below when the VAR models and results are explained.

In the context of the empirical work that was done for this paper and will be reported below, VAR models were constructed utilizing FNMA variables as well as housing starts, mortgage credit, and mortgage rates to examine the exogeneity and importance of FNMA to the determination of these variables and to

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[10]VAR estimation has been utilized recently by a number of investigators, most notably Robert Litterman of the Federal Reserve Bank of Minneapolis (1979), who was instrumental in developing the RATS program which is utilized for the estimation discussed in the test, and Thomas Sargent and Christopher Sims (1977). See also Sargent (1979) for an extensive bibliography on VAR applications, and Offenbacher, Porter, and McKelvey (1982) for an excellent intuitive introduction to VAR procedures.

their variation during the last housing and mortgage credit cycle. Before turning to these results, however, we present the results generated from a more conventional OLS investigation of FNMA's influence on housing starts during the last cycle.

Drawing on past work which has investigated FNMA's influence on housing starts, e.g., Jaffee-Rosen (1978), Rosen (1977), Kearl-Rosen (1974), a housing starts model of the following form was estimated:

$$HS = f(SLC, RY, MR, FNMAC)$$

where:

HS = total housing starts

SLC = mortgage commitments at S&Ls

MR = mortgage rate[11]

FNMAC = FNMA mortgage commitments

The housing starts model was estimated monthly from January 1980 through April 1984 to coincide with the most recent downturn in housing and its recovery.[12] Although equations were run solely contemporaneously, traditional econometric statistics and economic theory indicated that the best specified equations were those utilizing polynomial distributed lags (PDLs) on the key variables. The results of estimation using PDLs are reported in Table 1.[13]

Equations 1 and 2 in Table 1 use seasonally unadjusted housing starts data and seasonal dummy variables. Equations 3 and 4 use seasonally adjusted housing starts data. Equation 1 differs from equation 2 only in the specification of the income

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[11]Alternative mortgage rate series were utilized without affecting the results materially. Thus, only the results utilizing the FHLB series are reported throughout this section. A complete data glossary for all variables utilized in the econometric work reported in this section is contained in Appendix A.

[12]The same models reported in the test were also estimated for the period January 1979-April 1984 to allow for a buildup to the housing descent. In general, the results were little affected by the alteration in the sample period.

[13]The equations reported are all second degree polynomials with four period lags and no end-point constraints. However, additional lag lengths were experimented with and the results were essentially unchanged from those reported.

variable. Equation 1 specifies housing starts as a function of real income to conform more closely to theory and past work while equation 2 utilizes nominal income to take account of nominal changes as they affect housing.[14] Judged by traditional econometric statistics the equations are quite good, differing from each other only marginally. The R^2 for equation is close to 0.90 while the Durbin-Watson statistic indicates no serial correlation at the 1% level of confidence.[15] The signs on the

TABLE 1

HOUSING STARTS EQUATIONS

January 1980 - April 1984

Dependent Variable	Constant	RY	LHS	SLCP	MRP	FNMCP	Y	Seasonal	R^2	SE	D.W.
(1) HS	-55.96	32.7		.0155	-10.90	-.0002		Yes	.882	11.09	1.64
	(.48)	(2.61)		(3.87)	(7.73)	(.034)					
(2) HS	170.2			.0128	-13.35	-.0042	.042	Yes	.897	10.36	1.83
	(6.26)			(3.28)	(9.8)	(.89)	(3.56)				
(3) HSA	-2425.6	645.9		.0587	-152.0	.0123		No	.835	145.2	1.52
	(1.91)	(4.86)		(1.96)	(8.4)	(.21)					
(4) HSA	2213.5			.0289	-197.1	-.040	.741	No	.871	137.9	1.61
	(6.60)			(.96)	(12.55)	(.69)	(5.56)				
(5) HS	-31.3	22.07	.265	.013	-7.73	-.0002		Yes	.889	10.75	2.38
	(.275)	(1.63)	(1.76)	(3.25)	(3.42)	(.04)					

Note: All PDL equations are second degree polynomials, 4 period lags, with no end point constraints. t-statistics are in parentheses below the coefficients.

[14] Equations were also run with real income and the price index to separate nominal and real effects but the contribution of the price variable in the equations was small.

[15] It should be noted that no equation in Table 1 was adjusted for serial correlation since the D-W statistics did not indicate its presence. This suggests that the specifications were quite good.

statistically significant variables are as expected and all variables are statistically significant at the 1% level (t statistics are in parentheses below the coefficients) with the exception of the FNMA commitment variable. Essentially the same result holds true for equation 2. In equations 3 and 4, the SLC variable is also only marginally significant in equation 3 and non-significant in equation 4, but the FNMA commitment variable is still non-significant. Thus it is likely that using seasonally adjusted housing starts hides some information, since the SLC variable was highly significant in equations 1 and 2.[16]

Often in work of this type, the lagged housing starts variable is introduced to account for an adjustment process. Equation 5 reports an equation like 1 except for the addition of lagged housing starts. The lagged starts variable of the equation is only marginally significant and its apparent collinearity with RY causes that variable to appear non-significant. FNMA is still non-significant and since the explanatory power of the equation is little changed, the addition of lagged housing starts does not appear necessary to reach any conclusions. Based on the housing starts equations, then, it appears that FNMA played little role in influencing housing starts in the last cycle. But of course much more evidence is needed before any firm conclusions are drawn. This is essentially the purpose of the VARs. However, before turning to these results it is useful to discuss equations that were estimated for mortgage credit and the mortgage interest rate.

Standard mortgage credit equations and mortgage interest rate equations were estimated using several different functional forms. The equations were estimated over the same period, i.e, January 1980 - April 1984 (and the longer period noted in note 12). These equations are not reported to save space since the

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[16]These equations were also run with FNMA mortgage purchases substituted for FNMA commitments. The results were very similar.

models appeared to be less than robust.[17] However, mortgage credit, mortgage rates and FNMA commitments, are all included in the VAR models so we can examine their interaction explicitly. We now turn to those results.

Tables 2-4 present the results of the VAR estimation. The system in Table 2 contains housing starts, mortgage originations, FNMA commitments, and the mortgage rate. There were four lags for each variable composing the system.[18] The results reported are of two kinds. First the partial f statistics for each variable in each equation are reported. This gives the combined effect of all lags in this variable on the dependent variable. For example, the partial f in Table 2 on housing starts for the dependent variable housing starts is 4.98. This means that all four lags on housing starts taken together have a statistically significant effect on housing (in this case at the

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[17]There seemed to be considerable sensitivity to specification and substantial serial correlation in the equations. When the equations were corrected for serial correlation, many variables that were significant in the uncorrected form became non-significant. However, there was one unvarying result across virtually all equations. The FNMA commitment or purchase variables, which were each tried, were always non-significant when serial correlation was corrected. Only in some PDLs in the mortgage credit equation were FNMA commitments significant and here the D.W. statistic indicated serial correlation.

Some models were also run for the period of January 1979-December 1982 with essentially similar results for housing starts and the mortgage rate though FNMA commitments were significant in some mortgage credit equations. This period was chosen to isolate only the downturn in the last cycle when FNMA's impact might be expected to be greatest. The year 1979 was included so that there would be sufficient degrees of freedom to make the estimation meaningful. Finally the examination of a zero order correlation matrix suggests that the non-significant impact of the FNMA commitments variable in the equations reported in the text cannot be traced to problems of collinearity. In general the correlation coefficients between FNMA commitments and other independent variables were relatively low.

[18]Lag lengths of 3 to 6 months were estimated for all models reported and essentially the results were unchanged. The four period results were chosen for reporting because these lags conform most closely with the econometric work reported earlier as well as the usual assumptions about lags in the relationship between these variables. In both VAR estimation as in PDL estimation, there is often a tendency to overexperiment on lag lengths. This was resisted in this work with the lags specified as those that would be reasonable based on theory.

1% level of significance). The f statistics are utilized in place of individual t statistics because of the collinearity between the various lags of the same series.[19] The second set of results in Table 2 are for the variance decomposition of the forecast error over a 24 month period. The forecast error measures the contribution of future innovations to the forecasted dependent variable over the forecast horizon. Using the past variation of innovations as a forecast of future innovation variation, the forecast error variance can be estimated. Once the forecast error variance is generated, it can be decomposed. If a variable's innovations do not influence the variation in another variable, it will not contribute to the forecast error variance, and, hence, when forecast error variance is decomposed it will show negligible impact. Alternatively, if the innovation of one variable contributes a great deal to the forecast variance on another, one can infer an important and exogenous impact of the independent variable.[20]

The results for the four variable model in Table 2 show that FNMA is not significant in explaining the dependent variables, except for itself, as judged by the f-statistics. The mortgage rate and the own variable are significant in determining mortgage credit while the mortgage rate is significant in explaining FNMA commitments. This latter result is consistent with FNMA reacting to mortgage market conditions. The variance decomposition is more interesting.

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[19]However, since none of the models developed for the VAR estimation can be offered as complete models of the individual dependent variables (e.g., see the housing starts model in Table 1) the f statistics should be taken with a grain of salt. This is why the summary statistics, which are very good, are not reported. It is the variance decomposition that is of most interest to us.

[20]Offenbacher, Porter, and McKelvey (1982) put it this way:

> . . . the forecast error variance for a given variable is equal to a sum of terms in the variances and covariances of <u>all</u> the <u>innovation</u> series. The idea behind the variance decomposition is to attribute appropriate terms in this sum to each of the variables and then calculate, for each variable's innovation, the fraction of the overall forecast error variance accounted for by the terms attributed to that variable's innovations. This can be done for the forecast error of each variable and for any forecast horizon. In this way, one can analyze the pattern over time of the way that each variable's innovations influence the movements (i.e, the variation) in each of the variables in the system (pp. 11-12).

TABLE 2

VAR ESTIMATION
January 1980 - April 1984

Specification/Dep Var		Partial F's HS	MO	FNMC	MR
4 lags	HS	4.98	1.07	1.90	0.701
	MO	0.59	8.94	0.69	0.35
	FNMC	1.40	0.32	4.41	1.39
	MR	1.09	2.89	5.16	27.98

VARIANCE DECOMPOSITION
24 MONTH FORECAST

Month				
	For HS			
1	89.9	0.07	1.08	9.03
4	54.7	5.30	3.10	36.90
8	34.5	6.07	11.26	48.10
12	29.3	5.37	17.80	47.51
16	29.5	4.89	20.80	44.80
24	32.2	4.57	22.30	40.90
Month				
	For MR			
1	0.00	0.00	0.00	100.00
4	4.87	2.79	1.68	90.64
8	3.15	3.21	11.04	82.60
12	4.09	3.02	16.46	76.40
16	6.23	2.82	19.82	71.10
24	10.95	2.73	22.70	63.62
Month				
	For MO			
1	0.63	92.65	5.56	1.14
4	7.24	50.80	5.21	36.76
8	14.67	32.91	8.59	43.83
12	14.04	26.54	13.94	45.48
16	15.33	24.05	17.11	43.49
24	18.79	22.22	18.59	40.39
Month				
	For FNMC			
1	0.00	0.00	99.99	0.01
4	1.29	5.07	69.96	23.68
8	15.30	4.36	58.22	22.14
12	18.62	4.15	54.72	22.52
16	19.19	4.04	53.32	23.45
24	18.46	3.85	50.52	27.18

TABLE 3

VAR ESTIMATION
January 1980 - April 1984

Specification/Dep Var		Partial F's HS	FNMC	MR
4 lags	HS	7.98	2.17	0.82
	FNMC	1.89	4.98	1.60
	MR	1.82	6.02	35.55

VARIANCE DECOMPOSITION
24 MONTH FORECAST

Month	For HS		
1	100.00	0.00	0.00
4	81.72	2.05	16.23
8	63.77	9.24	26.98
12	57.12	15.36	27.52
16	56.71	17.67	25.62
24	56.70	18.02	25.27
Month	**For FNMC**		
1	1.51	98.49	0.00
4	2.96	73.51	23.52
8	9.85	60.81	29.34
12	11.34	56.96	31.20
16	11.64	55.07	33.29
24	11.14	51.95	36.92
Month	**For MR**		
1	9.11	0.00	90.89
4	25.89	0.80	73.29
8	22.20	9.05	68.75
12	22.42	14.00	63.58
16	24.48	16.72	58.80
24	27.75	18.41	53.84

TABLE 4

VAR ESTIMATION
January 1980 - April 1984

Specification/Dep Var		Partial F's MO	FNMC	MR
4 lags	MO	12.94	0.83	0.43
	FNMC	0.36	4.38	1.75
	MR	5.11	3.82	41.29

VARIANCE DECOMPOSITION
24 MONTH FORECAST

Month	For MO		
1	93.98	6.03	0.00
4	62.37	6.88	30.76
8	49.58	12.29	38.13
12	43.91	16.21	39.88
16	42.49	18.29	39.22
24	42.14	18.85	39.01
Month	**For FNMC**		
1	0.00	100.00	0.00
4	8.90	73.08	18.02
8	11.61	71.21	17.17
12	11.38	68.54	20.08
16	11.15	65.15	23.71
24	11.29	60.75	27.96
Month	**For MR**		
1	2.21	0.09	97.70
4	7.91	2.38	89.71
8	8.00	13.04	78.96
12	9.52	18.70	71.78
16	10.49	22.23	67.28
24	11.13	24.63	64.24

While the mortgage rate is important in contributing to the forecast variance of both housing starts and mortgage credit (note one should look at the whole column of numbers in forming judgments),[21] FNMA appears to play a much smaller role. The size of the decompositions suggests that FNMA commitments are not an important or exogenous actor in affecting mortgage credit or housing starts. A similar statement can be made for the equation when the mortgage rate is the dependent variable. This suggests that FNMA may not be acting substantially indirectly through the mortgage rate rather than directly on mortgage credit and housing starts. Moreover, the results suggest that FNMA did not act exogenously during the period January 1980 - April 1984 to affect the mortgage rate, mortgage credit, or housing starts. This does not mean it had no countercyclical effect, but the results imply that any countercyclical effect would have been very small. Coupled with the other results found through more traditional methods, these results are consistent with a non-significant role for FNMA during the last cycle.[22]

The model reported in Table 2 is the most complete model and the most useful to examine. However, some smaller, more specific models were also estimated. Tables 3 and 4 present the results for these smaller models. Table 3 includes a model with housing starts, FNMA commitments, and the mortgage rate. The partial f for FNMA in the housing starts equation now approaches significance and is not far behind in the mortgage rate equation. However, the decomposition still suggests a subsidiary role for FNMA in explaining housing starts variation and the mortgage rate variation. These results do show the largest response of FNMA commitments to mortgage rate shocks, and tend to confirm that FNMA is responding at least somewhat to the mortgage rate in its behavior. Another small model, this time including only mortgage credit, FNMA commitments, and the mortgage rate as components was examined. These results are reported in Table 4. Here the FNMA variable was clearly non-significant in the mortgage origination equation and appeared to contribute little to the forecast error decomposition for mortgage credit.

The implications of the econometric results for the entire study will be explored fully in the last section of this paper. However, to conclude the expirical portion and to summarize the

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[21]Note also that the forecast variance decomposition should equal 100 (100%) though the actuals may differ slightly due to rounding.

[22]Decomposition of the forecast variance can be sensitive to the ordering of the variables. Thus several orderings were examined. While there were some minor changes, none were sufficient to alter the thrust of the results. The ordering reported in the text was considered representative.

results, they suggest that the countercyclical role of FNMA was not substantial in this cycle. The difference between what has typically been found for the 1970s and these results is traceable to the deregulation of the financial system, innovation in the mortgage market, and changes in FNMA procedures. These will be discussed in the next section.

Before leaving the econometric results, however, it is useful to comment on some runs that were made on the spread between FNMA borrowing rate and government securities rates. In Kaufman (1977) runs of this type suggested that FNMA did have an impact on open market interest rates through its financing. While only a few experiments were run on this issue, the results essentially conform to these prior results. Thus in the 1980s FNMA borrowing continued to put upward pressure on open market rates.

V. FNMA, DEREGULATION, INNOVATION, AND THE FUTURE

The theoretical and empirical results in the previous sections yield some insights into the likely future role of FNMA in the mortgage market. Furthermore, the changes in FNMA procedures and activities also have implications for this role. This section will bring together the insights garnered from the results reported above and the changes that have taken place in the financial system, to assess FNMA's role in the mortgage market in coming years.

The theoretical section of this paper concentrated on the impact that FNMA might be expected to have through its commitments and its portfolio purchases. It was shown that FNMA would increase the supply of mortgage credit, putting downward pressure on mortgage rates and increasing the equilibrium supply of mortgage credit and housing starts. This theoretical framework has been the basis for much of the formal study of FNMA that has taken place in the past. Further, the theoretical work implied that it was primarily through the FNMA commitment process that these positive effects would be achieved. Mortgage takedowns by FNMA were financed in the open market, putting upward pressure on open market rates and in the environment of deposit regulation, inducing disintermediation from traditional mortgage lenders. This implied that over time, once the adjustment to the new higher open market rates was complete, FNMA's impact on the mortgage market would be potentially offset.[23] Thus, it might have no lasting effect on mortgage credit and housing starts. However, the timing of the entire process could be important in providing countercyclical help to the mortgage market at times of stringency.

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[23] In addition, adding to induced disintermediation, mortgage lenders that did have portfolio flexibility would, at the margin, respond to the higher open market-mortgage rate spread by moving out of mortgage lending. See Grebler (1980).

Previous work had shown, however, that FNMA had not been particularly aggressive in providing this countercyclical assistance even in the 1970s. Nevertheless, its countercyclical role was significant because of its endogenous reaction to mortgage market conditions coupled with its sheer size. If one accepts the time lag argument between FNMA commitments and the ultimate effect of its financing of its takedowns, then the window for countercyclical aid to the market was there.

The time lag between FNMA commitment activity and the potential reversal of the positive effect on the mortgage market through its financing of its takedown activity is based on two factors. First, the lag between its commitments and its purchases, only the latter requiring open market financing, and secondly the speed of adjustment to rising open market rates on the part of depositors receiving below market rates on their deposits at traditional mortgage lending institutions and institutions with portfolio flexibility. Therefore one question that needs to be addressed in assessing FNMA's role during the last cycle and particularly its future role is whether the changes that have occurred in the financial system and in FNMA's behavior have impacted upon this time lag.

Clearly the markets have become much more efficient due to the regulatory changes and innovations that have occurred over the last several years. These changes are continuing. Financial intermediaries can now pay market related rates for their deposit liabilities. Thus the issue of induced disintermediation in the old sense of deposits leaving in response to a gap between open market rates and deposit rates is no longer particularly relevant. However, combined with the liability flexibility that these institutions have achieved has come increased asset flexibility. One would expect, therefore, that there would be a much quicker response on the part of sophisticated financial institutions to favorable open market-mortgage lending rate spreads than by traditional depositors to favorable open market-deposit rate spreads. This implies that to the extent one believes that the countercyclical impact of FNMA was primarily a result of its ability to issue commitments, finance later, and then impact deposit liabilities at traditional mortgage lenders even later, that impact would be reduced as a consequence of the changes in behavior on the part of traditional mortgage lenders.[24] This analysis is supported by the somewhat surprising empirical results reported above on the role of FNMA in the last cycle. These results suggested little role for FNMA during the last cycle, despite the high level of its activity.

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[24]Complete asset flexibility on the part of thrifts is of course still limited by regulation as well as by the tax preferences for mortgage holdings. However, regulation is continuing to change. Further, asset-liability (AL) management has become of substantial importance to thrifts.

However, there are other reasons that likely contributed to these results that we should explore.

FNMA itself appeared to be caught up in the market changes that were going on over the last several years. It is likely that one of the major reasons it apparently had played a modest countercyclical role in the 1970s was its optional delivery program. In previous work that has been referred to above, Kaufman (1981a) suggested that its countercyclical role was an endogenous response to the market. Namely, offers picked up considerably during stringent times and while FNMA did not appear to respond to this increase in offers aggressively, as measured by the percentage of offers accepted, in issuing commitments, the substantial increase in offers led to a substantial increase in commitments. It is clear that FNMA was providing a cheap put option at that time. With mandatory delivery programs and market related fees, it is quite possible that in the latter part of the recent cycle the market worked effectively and FNMA's customer base responded in the manner economic theory would suggest.[25] FNMA has maintained that this change in behavior on its part was required by its own economics, arguing that as a private corporation, it cannot be indifferent to its profitability. As a federally sponsored agency that benefits from that status in its borrowing ability and stock market valuation, however, movements to increase fee income may inevitably conflict with its countercyclical public purpose intent.

Furthermore, a considerable amount of its other activity during the last cycle was also designed to increase its fee income as well as its spread. Its movement into second mortgages is a case in point. Second mortgages arguably have little affect on housing. Though some second mortgage financing may be used to meet downpayment requirements, it is clear that much second mortgage financing is utilized for general consumption purposes in lieu of alternative consumer financing. Thus, FNMA's entry into the second mortgage market may have diverted resources that would otherwise flow into the mortgage market through additional first mortgage purchases by FNMA. Resources were also devoted to the packaging of mortgages in MBS form which primarily attracts funds from traditional mortgage lenders according to FNMA's own analysis (FNMA, 1984).

Whatever the major reasons, the econometric results are reasonably unambiguous over the last cycle; FNMA's countercyclical role was not meaningful in the sense of positively affecting housing starts and mortgage credit availability. The VAR results did suggest some impact on the mortgage rate but even here the results were rather weak and were not supported by the traditional econometric modelling.

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[25]These changes took place, for the most part, while housing was recovering. However, the econometric work examines the entire cycle as previous econometric work had for earlier cycles.

What implications does this analysis have for the future? FNMA has often argued that it plays a unique role in the mortgage market. However, the development of private MBS activities, the accessing of the Eurobond markets by private borrowers, the Secondary Mortgage Market Enhancement Act, and the possibility of a TIMs bill passing, all suggest that the private sector is becoming more capable of providing its own liquidity. Furthermore, the increased flexibility enjoyed by traditional mortgage lenders suggests that they will be able to maintain deposits during periods of high interest rates. If mortgage lending is attractive due to adjustable rate mortgages, for example, which they are willing to hold in portfolio, they will continue to supply funds to this market even when interest rates rise, though total mortgage lending will depend on the interest elasticity of demand. FNMA will continue to be an outlet for fixed rate loans primarily, exposing it to interest rate risk if it purchases these loans for portfolio, thus also exposing the government to additional risk. If it repackages these loans and sells them, its impact in providing new funds to the mortgage market may be slight unless the purchase base for MBS expands considerably.

FNMA clearly benefits from its government sponsored agency status in its borrowing costs and its ability to leverage. The government by granting this status clearly subsidizes the mortgage market in a way that may no longer be necessary. Furthermore, by FNMA behavior over the last cycle and the likely continuation of these trends, FNMA suggests a private intermediary that happens to be operating with a government halo. There are potential costs to the government and real resource costs to the economy at large in this current behavior[26] and it is appropriate to question the validity of paying these costs given the failure to detect any positive benefit from FNMA activity during the last cycle and the likelihood that this result will hold in future cycles.

VI. CONCLUSIONS

The theoretical discussion, review of past work, and the econometric work reported in this paper, all suggest that the impact and behavior of FNMA have changed significantly. These changes are a result of both the change in the financial system due to deregulation and financial innovation and the change in FNMA procedures. FNMA did not appear to have significant countercyclical impact during the most recent credit cycle. It may be that this result stems from FNMA's concern with generating fee income through its MBS activity, mandatory delivery, and

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[26] Real resource costs refer to those discussed in the theoretical section above. They are not a result of FNMA activity exclusively by any means, but FNMA activity clearly contributes.

market related commitment fees, though its own analysis suggests that its major benefit to the mortgage market comes only through its activities that lead to the acquisition of mortgages for its portfolio.

The results of this study raise questions as to the continued benefit of FNMA in its present form as a government sponsored agency, exposing the government to explicit risk in terms of its line of credit to FNMA and implicit and potentially much greater risk in terms of its moral obligation to the holders of FNMA paper. To the extent FNMA acts to reduce this risk, it appears also to reduce the effectiveness of its activities in assistance to the mortgage market. While it would be presumptuous to suggest that solely on the basis of the work that was reported in this paper, FNMA no longer serves a major public purpose, the work does raise sufficient doubts about whether the benefits of FNMA are sufficient to have it continue in its present form at substantial potential cost to the government. FNMA can counter this argument by suggesting that its present policies ensure its future profitability and thus this risk to the government is small, but it would appear at reduced effectiveness in providing assistance to the mortgage market. It could be argued that if such is the case, FNMA can be freed from its government status and the market can decide if it is a viable financial entity serving a useful economic role.[27]

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[27]There is no suggestion here that FNMA should immediately lose its government status. This would be unfair to its note and debenture holders, not to mention its stockholders. However, the issues raised in this paper do lead to a conclusion that such a status change should be considered over some relatively short time period. See also The President's Commission on Housing (1982); Seiders (1982) and Grebler, in Cotton, Seiders, and Tuccillo, eds. (1983).

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APPENDIX A

Variable Definitions

HS - Total housing starts, not seasonally adjusted, Citibase data tape

HSA - HS seasonally adjusted

RY - Personal income deflated by the consumer index, Citibase data tape

Y - Nominal personal income

SLC - Savings and loan association mortgage loan commitments outstanding, not seasonally adjusted, Citibase data tape

MR - FHLB mortgage rate on conventional loans, Federal Reserve Bulletin

FNMC - FNMA mortgage commitments, FNMA and the Federal Reserve Bulletin

MO - Total originations of mortgage loans, HUD

Seasonal - Seasonal dummy variables

Comment On Herbert M. Kaufman, "FNMA And The Housing Cycle"

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One of the things government-sponsored agencies do particularly well is to devise a rich variety of rationales for their continued existence. This has the advantage that replacement rationales can be called to the front as soon as an existing rationale falters. Since Kaufman questions only one rationale and does not deal with all possible rationales an ingenious agency can put forward, FNMA has little to fear from his paper. There should be even less concern about my few comments.

Kaufman finds that FNMA can be expected to do but little to moderate housing cycles. Furthermore, it has made only a small contribution to evening the latest such cycle, which he dates 1980-84. I shall follow the same division between prior reasoning and consideration of empirical evidence in the organization of my comments. I will also address his policy recommendations.

Other issues will receive short shrift. Since the double-bottomed recession of recent memory correlated very closely with movements in real interest rates, and hence housing, there is no need to quibble about timing differences between the housing cycle and the general reference cycle and how they affect the stabilization rationale. William Gibson (1973, 1974), Craig Swan (1971), and Dwight Jaffee and Kenneth Rosen (1979) have dealt with such matters. Kaufman clearly accepts the proposition that stabilizing a particular sector--housing--is good, even if there is no intention to stabilize the output of other sectors, say defense industries, and even if housing is a normal casualty of disinflation under our tax (preference) system, with disinflation nevertheless intended. I will accept his prejudgment of some of these issues less out of conviction than the desire to move on.

Prior Reasoning

As a privileged agency that benefits along with others (GNMA, FHLMC) to some degree from reinsurance services provided without charge by the federal government, FNMA is able to place its liabilities at lower cost than its mortgage collateral would, by itself, warrant. FNMA might need this cost advantage to run a business that would otherwise be unprofitable. Alternatively, it might not need it but uses it (1) to subsidize its own operational inefficiency, (2) to generate economic rents, or (3) to pass the savings on to mortgagors by buying at above-market prices or below-market yields. The auctioning of mortgage purchase commitments prevents any simple pass-through of the federal subsidy since all mortgage holders would want to sell at above-market prices if such prices were, in fact, paid. This rules out (3). Hence, it would appear that the grant implied by federal sponsorship subsidizes either waste or economic rent, with the homebuyer being affected only to the extent FNMA commitments and purchases succeed in moving market-clearing mortgage rates, or their differentials with other rates.

Kaufman feels that the level of such rates could be independent of FNMA activity. A good argument for this position would be that adding a low-cost supplier of administered size is not going to depress the market price, just as allowing a fixed number of low-cost Japanese cars into the United States is not going to keep them cheap. Another argument is that FNMA runs a sideshow on a treadmill because it buys from, and sells to, essentially the same portfolios of institutional investors with only minor instrument and little maturity transformation achieved.

A less plausible argument is that even if FNMA financed itself with instruments very different from its assets, it would be pulling as much money out of the mortgage market as it is pumping in. There is no reason to assume that such instruments would compete exclusively with mortgage lending or the means used to support such lending. Rather, mortgages would become scarcer in private portfolios the more FNMA buys them if financed (say, via access to the Federal Financing Bank and thence to the U.S. Treasury) with instruments whose portfolio characteristics were not close to those of mortgages. In a portfolio balance model, such a development would imply a reduction in the market-clearing yield of mortgages relative to other assets.

The flip side of such a change in relative yields would spell disadvantage for most (or all, if assets are gross substitutes) borrowing and investment purposes other than those served by mortgage credit. According to Patric Hendershott and Sheng-Cheng Hu (1980), Hendershott (1981), and Martin Feldstein (1982), those other purposes, business fixed investment chief among them, are already substantially undersupplied. The reason is that unlike housing, they are penalized rather than pampered under the (corporate and individual) income tax system. From this point of view, adding credit preferences to tax preferences would only make the malallocation worse if the credit preferences are effective. The best one could hope for would then be that they are not effective and that FNMA generates only economic rents with federal help. Such rents could be revealed by comparing the market value of the debt and equity claims on FNMA with the market value of its financial assets to see whether Tobin's q exceeds unity. If so, FNMA would have a continuing incentive to expand for the benefit of its stockholders, capitalizing on the value of federal sponsorship.

It may be added, however, that the cost of such sponsorship is borne not primarily by the U.S. Treasury, either actually or contingently, but by other borrowers who are set back in the credit queue. Even with the large fiscal deficits of recent years, federal government debt amounts to "only" about one-quarter of total nonfinancial debt outstanding in the United States. Benjamin Friedman (1983) explains the history of such ratios and much else.

Empirical Evidence

In his econometric section, Kaufman first offers reestimates of what he regards as traditional housing starts equations. The explanatory variables are real or nominal personal income, loan commitments, a nominal mortgage rate, possibly lagged housing starts, and FNMA mortgage commitments. The latter have a generally negative and always statistically insignificant coefficient in the single-equation regressions. I shall ignore the fact the FHLB advances and FHLMC activities are not included in any equation. I will also not dwell on the point that housing starts should be studied in the context of a stock adjustment model (von Furstenberg and Eric Herr, 1975) and that household formation figures also.

Dealing only with Kaufman's variables, over the part of the present decade constituting the sample of his monthly observations, 1980:1 to 1984:4, real personal income presumably functions as a crude cyclical variable which should catch something because the housing cycle and the general business cycle were rather closely synchronized. Nominal personal income simply does not belong in a housing starts equation, though it happens to pick up the decline in the rate of inflation that was associated with rising real interest rates. The latter do not show anywhere in the specification, although they shot up dramatically in 1981 and then remained extraordinarily high throughout the remainder of the sample period as disinflation progressed. The path of real interest rates I am referring to is derived in an earlier piece (von Furstenberg, 1983) using ex ante forecasts of the inflation rate. If the rise in real interest rates and home price disinflation, both of which depressed starts, coincided with increased FNMA commitment activity, the latter may capture the effect of omitted variables with a negative sign.

I still believe that FNMA commitments may not have been significant, but not because of the econometric results reported so far. Furthermore, if significant, it would still have to be shown that these commitments were in fact timed for stabilizing effect.

Kaufman's VARs are more interesting, although at least as subject to omitted-variable problems. For while the VAR technique requires that all variables admitted to the system must be entered into each equation with lags up to some common limit, it is easily defeated if variables are wrongly barred from entering the unconstrained whirl. Still, I find partial-F statistics always captivating.

In Table 2 they tell me that housing starts are explained by their own history and little else. The same holds for total mortgage originations and FNMA commitments. I realize that a technically complete description of the results, say, that only lagged starts appear to influence housing starts and that FNMA

commitments do not, would be: "Given the effects of lagged starts, total mortgage commitments, and mortgage interest rates on housing starts, FNMA commitments fail to be significant in incrementally explaining such starts." I shall spare you such verbiage in stating loosely that only in the equation for nominal mortgage interest rates does anything other than the history of the dependent variable ever incrementally explain anything.

We must also not forget that partial F's and variance decomposition can only tell about there being effects relative to the null hypothesis of independence. They can not reveal whether an effect, if significantly different from zero, directionally accords with prior judgment.

Altogether I find that Kaufman's econometric methods and findings are likely to be persuasive to those whose priors are not upset by his results. Personally I would thus rate them a good try.

Policy Recommendations

I agree with Kaufman that, judged by his criterion of contributing to the stabilization of the housing cycle, FNMA can not do, and has not done much good. I would add that its growth, as well as that of FHLMC, is excessive and worrisome, because both, trading on federal sponsorship, may in a small way contribute to maintaining housing stock and land values higher, and the stock of business capital lower, than they would be in a more neutral setting.

Supporting an excessively large stock of anything does not, of course, permanently raise additions thereto (say, housing starts) except for replacement. Supporting bloated land values through subsidies that get capitalized in the value of relatively fixed assets is also injurious. It hurts the poor, who are not subsidized by the existing tax system to nearly the same extent as those in high tax brackets in their expenditures for housing and mortgage credit. By deflating land values, a flat-rate tax would help redress the government's regressive redistribution of housing opportunities that once was ameliorated by the activities of HUD in the areas of low-income housing and homeownership. Looking beyond redistributional issues, to the extent FNMA and others make "cashing out home equities" through second mortgages and the like ever easier, they do not encourage saving even if some of the equity withdrawn is used not for additional consumption but reinvested elsewhere.

I further agree with Kaufman that FNMA, and not it alone, should be privatized completely, although I know that this outcome is highly unlikely. If it happens, stockholders should not be compensated for the forfeiture of economic rent. Rather, as a private corporation, FNMA would owe for the valuable privileges and benefits it has received so far--benefits which have allowed it to fatten not just at federal expense.

Furthermore, FNMA should be subject to increased prudential oversight. Since two out of the three government agencies charged with supervising the financial system of the nation, as it relates to money and credit, have forgotten that deregulation requires increased, not reduced, prudential supervision, little might be gained by such a step initially. Nevertheless, FNMA, like Continental Illinois, is too big to fail. This requires a close eye on whether FNMA might ever be courting disaster under the present or alternative arrangements and charters. Obviously HUD and the GAO are not the ones to conduct such examinations on a continuing basis with the nation's entire financial system in mind.

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An Analysis Of The Credit Risk Inherent In FNMA's Recent Portfolio Acquisitions Of Adjustable Rate Mortgages

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Introduction

The Federal National Mortgage Association (FNMA) has sustained significant losses in recent years. A portion of these losses has resulted from increased defaults and foreclosures on properties held in FNMA's portfolio. For the nine months ending September 30, 1984, FNMA's losses through foreclosure totaled $70.2 million, representing over 62 percent of the institution's Allowance for Loan Losses account. As recently as 1981 such foreclosure losses accounted for only 1 percent or less of this account.

It shall be the purpose of this paper to analyze the extent to which these losses can be attributable to FNMA's acquisition of Adjustable Rate Mortages (ARM's), which began in 1981, and to analyze the credit risk inherent in FNMA's future acquisition of ARM designs approved since 1981. Specifically, the following tasks shall be undertaken: (1) the volume and terms of FNMA ARM acquisitions will be identified to the extent possible given data availability; (2) this information will be correlated with FNMA default and foreclosure trends, and we will attempt to determine the extent increased defaults can be associated with such ARM features as negative amortization, deep buydowns, "teaser rates," and payment adjustments; (3) the existing literature on mortgage default will then be surveyed to identify those models capable of evaluating default risk empirically for a variety of ARM types; and (4) the most useful of these models will be used in simulations of performance of the various loan designs approved by FNMA for purchase since 1981. These simulations shall be concerned not only with the degree of increased default risk under the ARM designs, but also with the extent to which such increased default risk offsets increased yields attributable to the yield flexibility of the ARM; in other words, the extent to which credit risk is traded off against interest rate risk.

How Extensive Have FNMA's ARM Acquisitions Been?

FNMA approved a number of ARM designs for purchase in 1981 and rapidly increased its volume of ARM holdings. This aggressive acquisition of ARM's was driven by the necessity of better matching the maturities of its assets and liabilities, hence reducing its interest rate risk exposure. During the high interest rate environment of the late 1970's and 1980's, FNMA, along with most other lenders, was faced with a lower yield on its existing portfolio of older fixed-rate mortgages (FRM's) than its cost of funds in the marketplace.

FNMA switched its portfolio acquisitions dramatically from FHA/VA loans to conventional loans and from fixed-rate conventional loans to ARM's. Exhibit I clearly illustrates this trend. From 1979 to September 1984, its mortgage portfolio concentration in FHA/VA loans on homes dropped from 57.5 percent to

only 34.5 percent. Its acquisitions during this period were even more skewed. In 1979, 49.9 percent of its purchases were for government insured or guaranteed home mortgages; by September 1984 this had dropped to 0.9 percent. At the same time, the proportion of its conventional loan portfolio which was made up of ARM's increased from 0.5 percent in 1981 to 22.0 percent as of September 1984. The proportion of conventional loan acquisitions which were ARM's increased from 2.8 percent in 1981 to 38.6 percent for the first nine months of 1984. The proportion of conventional loan commitments which were for ARM's was even higher, reaching over 40 percent for the first nine months of 1984 (Exhibit II).

There is no doubt that this high volume of ARM acquisition resulted in greater asset yield flexibility than would have been true for continued FRM acquisition. However, it does not seem to be the case that ARM features, per se, were responsible for the increase in yields on FNMA's asset portfolio experienced during the 1980's. The average yield net of servicing on FNMA's mortgage portfolio rose from 8.75 percent in 1979 to 10.90 percent in the first nine months of 1984. The average net yield on mortgages purchased increased during this period from 10.11 percent to 15.38 percent by 1981, then dropped to 12.53 percent for the first nine months of 1984, reflecting general declines in interest rates. Only 1 and 3-year ARM's originated in 1981 and sold to FNMA would have faced interest rate adjustment periods by September 1984, and these would have faced downward adjustments. In addition, the fact that ARM's during this period were offered at lower interest rates than FRM's (originally about 25 bp lower, with the spread increasing over time) implies that if ARM's had any effect on FNMA's asset portfolio yield over this period, it was a negative effect relative to its continued acquisition of FRM's only. Not only were the loans originated at lower rates, they were adjusted downward when they "rolled over."

What Type of ARM's Has FNMA Purchased and From Whom?

Ideally, to be able to forecast accurately FNMA's default risk inherent in its ARM purchases, it would be necessary to have a detailed account of the characteristics of each ARM acquired. However, unfortunately, such information is not able to be acquired from FNMA, so it is necessary to make inferences about these loans from impressions provided by those knowledgeable about FNMA acquisitions and surveys of characteristics of loans being originated.

Exhibit I

FNMA Mortgage Portfolio
(Dollars in Millions)

	1979	1980	1981	1982	1983	First 9 Mo. 1984
Total Unpaid Balance	51096.8	57326.6	61411.9	71813.7	78256.2	84850.5
Home Gov't Insured	29381.7	33416.7	34550.7	33742.3	30999.9	29237.9
% of Total	57.5	58.3	56.3	47.0	39.6	34.5
Home Conven.	16106.0	18358.0	21435.3	32757.0	42045.0	49937.6
% of Total	31.5	32.0	34.9	45.6	53.7	58.9
FRM	16106.0	18358.0	21153.2	27789.6	32533.3	36567.5
ARM	—	—	106.8	3331.9	7126.3	10970.9
% of Conven. ARM	—	—	0.5	10.2	16.9	22.0
Second	—	—	175.3	1635.5	2335.4	2399.2
Project Gov't Insur.	5609.1	5551.9	5425.9	5283.3	5148.3	5079.8
% of Total	11.0	9.7	8.8	7.4	6.6	6.0
Conventional						
FRM	—	—	—	31.1	63.0	526.7
ARM	—	—	—	—	—	68.5
% of Conven. ARM	—	—	—	—	—	11.5
Avg. Yield Net of Serv.	8.75%	9.24%	9.85%	10.73%	10.70%	10.90%

Exhibit I (Continued)

	1979	1980	1981	1982	1983	First 9 Mo. 1984
Purchases During Period	10807.2	8101.1	6112.9	15115.8	17557.0	12376.2
Home Gov't Insured	5387.8	5272.5	2284.0	901.1	186.1	114.7
% of Total	49.9	65.1	37.4	6.0	1.1	0.9
Home Conven.	5410.2	2801.8	3827.0	14205.2	17356.6	11732.1
% of Total	50.1	34.6	59.7	83.7	90.8	91.2
FRM	5410.2	2801.8	3544.3	9442.9	11702.4	6764.8
ARM	—	—	106.8	3210.0	4246.3	4525.7
% of Conven. ARM	—	—	2.8	22.6	24.5	38.6
Second	—	—	175.9	1552.3	1407.9	441.6
Project Gov't Insur.	9.2	26.8	1.9	9.5	8.1	—
% of Total	0.1	0.3	0.03	0.1	0.05	—
Project Conven.						
FRM	—	—	—	—	6.2	456.7
ARM	—	—	—	—	—	72.7
% of Conven. ARM	—	—	—	—	—	13.7
Avg. Net Yield on Mortgages Purchased	10.11%	12.27%	15.38%	15.00%	12.65%	12.53%

Source: FNMA Debt Guide, Third Quarter 1984.

Exhibit II

FNMA Home and Project Commitments
(Dollars in Millions)

	1979	1980	1981	1982	1983	First 9 Mo. 1984
Total Commitments	10179.3	8082.5	9470.7	22106.0	18607.2	14461.4
Home	10139.6	8080.8	9470.6	22096.8	18601.1	13838.5
Conven.	4441.4	2510.8	6499.6	21173.6	18460.1	13806.2
FRM	4441.4	2510.8	4897.0	13401.7	10561.9	7481.7
ARM	—	—	1389.4	6027.3	6572.7	5596.8
% of Conven. ARM	—	—	21.4	28.5	35.6	40.5
Second	—	—	213.2	1744.6	1325.5	727.7
Multifam./ Project	39.7	1.7	0.1	9.2	6.1	622.9
FRM	39.7	1.7	0.1	9.2	6.1	544.7
ARM	—	—	—	—	—	78.2
% of Conven. ARM	—	—	—	—	—	12.6

Source: FNMA, Memorandum to Investors and Financial Analysts, Third Quarter 1984.

When FNMA first approved ARM purchases in 1981, they approved 8 plans tied to different indices ranging from 6-month Treasury securities to the Federal Home Loan Bank Board (FHLBB) interest rate series on existing homes. Several had interest rate or payment caps and restrictions on the degree of negative amortization permitted (discussed fully in Hart [1984]). These were consolidated in September 1983 into three plans with payment caps indexed to 1-, 3-, and 5-year Treasury securities, respectively. These payment capped instruments are described in detail later and are summarized in Exhibit VIII. They all restrict payment increases to 7.5 percent for each adjustment period (or annually, if negative amortization persists), and are restricted to a maximum deferred interest of 125 percent of the original mortgage amount. The graduated payment feature is permitted, and buydowns and discounts are restricted. Income ratio tests are the same as for the FRM, applied to the first year's payment, with the exception of the graduated payment loan which faces a more restrictive payment-to-income ratio. In addition, in September 1983, new guidelines were issued for FRM purchases which limited the level of buydown permitted.

In October 1984, FNMA also issued a supplemental set of guidelines to permit the purchase of interest-rate capped instruments. These instruments are also discussed fully later and are summarized in Exhibit VIII. Designated as plans 5-0, 5-1, and 5-2, respectively, they are all indexed to the weekly average yield on 1-year Treasury securities, with annual interest rate and payment adjustment intervals. All plans have a 5 percent lifetime loan cap. Plan 5-0 has a 7.5 percent annual payment cap, while plans 5-1 and 5-2 have a 1-percent and 2-percent annual interest rate cap. Like the payment-capped instruments, they have a maximum limitation on negative amortization of 125 percent of the original mortgage amount, limitations on buydowns and discounts, a permitted graduated payment feature, and similar limits on income ratios. In addition, they feature an option for conversion to a FRM.

Apart from the above instruments, FNMA is also permitted to make acquisitions of loans which deviate from their standards through a negotiated loan window. Taken together, this means that FNMA since 1981 has been able to buy 14 separate ARM plans (not including the graduated payment (GPARM) options) plus the FRM and any combination of "nonstandard" instruments. Even this does not recognize the large number of options permitted in each design. Without accurate accounting by FNMA of the types of ARM's they have purchased, it thus becomes virtually impossible to directly extract the ARM characteristics of its asset portfolio.

One option we are left with is an analysis of the characteristics of ARM's being originated in the marketplace, which would require an assumption that FNMA purchases are being made in the same proportion as all ARM's originated. The Federal Home Loan Mortgage Corporation (FHLMC) in August 1983 surveyed a

random sample of 600 savings and loan associations, the 75 largest commercial banks, and 75 largest mortgage bankers about their ARM programs (see FHLMC [1983]). These results are summarized in Exhibit III. At that time, the predominant instruments were 1-year and 5-year notes, although 3-year loans made up one-fifth of those being made. Over half of the ARM programs required either rate or payment caps. Over 60 percent used a Treasury index, with 20 percent using the FHLBB contract rate.

An updated survey by FHLMC in November 1984 of 100 lenders (FHLMC, Primary Mortgage Market Survey, week ending November 24, 1984) indicated an increased trend toward one-year instruments with interest or payment caps and indices tied to Treasury rates (Exhibit III). Almost 90 percent of the institutions used Treasury indices, with only 8.5 percent using the cost of funds index, and 87.2 percent offered a periodic rate cap, with the dominant cap being 2 percent. Over 90 percent offered a life-of-loan rate cap, with the vast bulk of those higher than 5 percent. Only 12.8 percent of the institutions, however, reported using a payment cap. Clearly the interest-rate capped ARM has started to dominate the marketplace. The FHLMC survey further found over 8 out of 10 lenders offered an initial period discount and almost 7 out of 10 used the lower initial period payment to qualify the borrower against the income guidelines.

These results provide evidence that the "experimentation" in instruments which occurred in the first couple of years after ARM introduction has started to settle out into relatively few instruments, mostly 1-year instruments tied to the Treasury index with annual and/or life-of-loan interest-rate caps and initial period discounts. The extent to which these patterns reflect the makeup of FNMA's ARM portfolio depends upon the extent to which FNMA purchases reflect the origination profile.

There is indirect evidence to indicate that the FNMA ARM acquisitions do indeed follow the general market trend. A spokesman for FNMA (Hook [1985]) confirms that in the beginning of the ARM purchase program, the predominant instrument to be purchased was a five-year note. Shorter-term instruments received relatively little discount from the FRM rates and, given interest rate volatility patterns at the time, were uncompetitive. More recently, in late 1982 and early 1983, interest rates fell and there was a considerable switch to 1-year ARM's. Now FNMA's business is approximately 90 percent 1-year ARM's. Although interest-rate capped ARM's, as standardized by the 1984 guidelines, are relatively new, FNMA has issued commitments to buy over $3 billion in such instruments, making them the largest investor in interest-rate capped ARM's today. The most popular of the interest-rate capped designs appears to be plan 5-2, with the 2-percent annual interest rate cap. Buydowns and discounts are very frequent, and often extend to the limits imposed by the purchase guidelines to permit qualifying for the maximum loan amount.

Exhibit III

Characteristics of ARM's Issued: FHLMC Survey Results

Adjustment Period	August 1983 ARM Survey	November 1984 Primary Mortgage Market Survey
6 Months	1%	
1 Year	36	100%
3 Years	21	(Only 1-year
5 Years	24	ARM's Surveyed)
All Other	9	
Index		
Treasury	61%	89.4%
Cost of Funds	12	8.5
FHLBB Contract Rate	20	
Other	7	2.1
Cap		
Rate or Payment	55.1%	99.4%
Rate	35.9	94.6
Periodic	15.1	87.2
1%	—	5.3
1.5%	—	8.5
2%	—	73.4
Life of Loan	4.2	93.6
5%	—	9.5
5%+	—	84.1
Both	16.5	86.2
Payment	19.4	12.8
Both	12.2	7.9
Offering Initial Period Discount	—	83.9
Qualification Rate	—	100.0
Initial	—	69.8
Fully Indexed		22.9
Other	—	7.3

Source: FHLMC, What Makes an ARM Successful?, 1983; FHLMC Primary Mortgage Market Survey, Week Ending November 23, 1984.

There is less difficulty in determining where FNMA buys its ARM's than determining the type of ARM it buys. Exhibit IV indicates the source of loan purchases by FNMA in the third quarter 1984, categorized by loan type. Note that mortgage bankers are not only the largest providers of ARM's to FNMA, they are the most heavily concentrated in ARM (as opposed to FRM) provision (excluding "other" institutions). S&L's provide the second largest block of ARM's, but are significantly less concentrated in ARM sales. These results correspond to the findings of FHLMC's 1983 ARM survey, which found that the primary sellers of ARM's in the secondary market are mortgage bankers and S&L's acting like mortgage bankers. Other S&L's are desirous of keeping their ARM originations in order to reduce their interest rate risk exposure.

Default and Foreclosure Loan Loss Trends in the FNMA Portfolio

FNMA's loan losses caused by default and foreclosure have increased dramatically since 1979 by any standard. These are summarized in Exhibits V and VI. In Exhibit V we see that the proportion of loans that are delinquent has increased from 3.5 to 4.9 percent between 1979 and 1984. Those under special lender forebearance have increased from 0.1 to 0.6 percent during the same period, and those in foreclosure have increased from 0.3 to 0.8 percent. Thus the total proportion of "loans in trouble" has increased by 57.5 percent, from 4.0 percent to 6.3 percent. Most of this increase has come since 1981.

Exhibit IV

FNMA Mortgage Purchases by Selling Institution
Third Quarter 1984

(Dollars in Thousands)

Selling Institution	FRM		ARM			
	No.	Amount	No.	Amount	% ARM	% of ARM's
Mtg. Cos.	15042	494812	9231	597777	54.7	55.2
Comm. Banks	9736	274110	351	27234	9.0	2.5
Mut. Sav. Bks.	2610	68139	739	39221	36.5	3.6
S & L's	20023	714556	5155	334082	31.9	30.8
Invest. Bkrs.	10027	280581	—	—	0	0
All Other	250	8878	1312	85042	89.5	7.8
Total	57688	1842176	16788	1083356	37.0	100.0

Source: FNMA Report No. 4, Statement of Loan Portfolio, Quarter Ending September 30, 1984.

Exhibit V

FNMA Conventional Whole Loan Delinquency Experience

(Percent of Portfolio by Numbers of Loans)

Period of Delinquency	At December 31					At Sept. 30
	1979	1980	1981	1982	1983	1984
One Month	2.9%	2.7%	2.9%	3.3%	3.5%	3.6%
Two Months	0.5	0.5	0.5	0.7	0.8	0.8
Three or More Months	0.2	0.1	0.2	0.3	0.5	0.5
Total (1)	3.6%	3.3%	3.6%	4.3%	4.8%	4.9%
Under Special Lender Forebearance (2)	0.1%	0.3%	0.2%	0.4%	0.5%	0.6%
In Foreclosure (2)	0.3%	0.5%	0.6%	0.6%	0.9%	0.8%
Total Problem Loans	4.0%	4.1%	4.4%	5.3%	6.2%	6.3%

Notes: (1) Delinquency percentage exclude loans in foreclosure or under special lender forebearance.
(2) A substantial percentage of loans under special lender forebearance or in foreclosure are reinstated.

Source: FNMA Debt Guide, Third Quarter 1984.

Exhibit VI

FNMA Provision/Allowance for Conventional Loan Losses
and Net Losses
(Dollars in Thousands)

Allowances For Conven. Loan Losses	1979	1980	1981	1982	1983	9/30/84
Balance at Beginning	89579	118593	133380	99433	125095	112559
Provision for Losses	29809	15699	(33135)	29583	34406	52458
Provision as % of Conven. Portfolio	0.19	0.09	(0.15)	0.09	0.08	0.14*
Losses	795	912	812	1601	38386	70191
as % of Conven. Portfolio	.00494	.00497	.00379	.00488	.09116	.18520*
as % of Balance	0.89	0.77	0.61	1.61	30.69	83.14*
Loss per Foreclosure	3.63	2.48	1.34	1.26	12.96	19.56
MBS Transf.	0	0	0	2320	8556	1129
Balance at End	118593	133380	99433	125095	112559	93697
as % of Conven. Portfolio	0.74	0.73	0.46	0.38	0.27	0.19
No. of Foreclosures During Period	219	368	606	1270	2963	3588
Percent Foreclosed	.0553	.0845	.1233	.2354	.5503	1.1873*

* Annualized.

Source: FNMA; FNMA Debt Guide.

Exhibit VI reveals that the major problem with default and foreclosure losses, however, has come from the losses incurred on each loan and not simply from the number of loans going into default. The losses per foreclosure have increased dramatically the last two years. As late as 1982, they remained in the $1200 to $3600 range, but increased to $13,000 in 1983 and $19,600 in 1984. The cause for this significant increase will be discussed later. As indicated in Exhibit VI, this has meant losses to FNMA which have increased from $1.6 million in 1982 to $38.4 million in 1983 and $70.2 million by the end of the third quarter 1984.[1]

As a result of these severe losses, FNMA has seen necessary to increase its provision for loan losses to $34.4 million in 1983 and $52.5 million by the third quarter 1984. In spite of this, its Loan Loss Allowance account declined from $125.1 million at the end of 1982 to only $93.7 million by September 30, 1984. Whether this is an appropriate size for the account can be judged by looking at the losses as a percent of the account balance and the account balance as a percent of the conventional loan portfolio. As late as 1982, losses represented less than 2 percent of the Loan Loss Allowance. By 1984, they represented 62.4 percent of the Allowance. At the same time, the Loan Loss Allowance as a proportion of the total conventional loan portfolio dropped from 0.7 percent in 1979 to 0.2 percent in 1984. This suggests the desirability of revising the formula which governs provision of funds into the Loan Loss Allowance. Increasing the Allowance again to the level of 0.75 percent of the conventional loan portfolio would require its size be increased to $379.0 million, a four-fold increase.

To What Extent Are ARM's Responsible for FNMA's Loan Losses?

We come finally to the question of whether the fact that FNMA began and aggressively increased its ARM purchases had anything to do with the steep rise in foreclosure losses which

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[1]It should be noted that these results are distorted somewhat by a change in accounting which FNMA adopted in September 1982. For 1979 through 1982, net losses were determined upon disposition of the foreclosed properties by subtracting from the proceeds realized the sum of the book value of the foreclosed asset and related foreclosure costs, expenses, interest accrued but uncollected to the date of foreclosure and other carrying costs. Beginning in September 1983, estimated losses on acquired properties are charged to the allowance for losses when properties are acquired rather than at disposition. Write-downs to market for properties on hand produced a charge to the allowance for losses of $20.1 million in September 1983. Also charged to the allowance in September 1983 was $6.2 million related to below-market financing on sales of acquired properties in all prior periods.

occurred at about the same time. Here we must turn again to the indirect evidence on loan purchases presented above, for there is no information publicly available which segregates default rates in the FNMA portfolio by loan type.

We saw above that because of the types of ARM's purchased and the short time frame, relatively few of the ARM's in FNMA's portfolio have reached their adjustment date, and those that have found their new rates to be at comparable or lower rates than before because of the downward trend in interest rates since 1981. This implies that "payment shock", the sudden upward increase in payments caused by an adjustment in the index rate, could not be a factor in the increased defaults. In fact, because ARM's were typically originated at a rate lower than that for FRM's, there could even be some slight benefit from going to ARM's as they relate to default risk. It would also follow that negative amortization caused by such payment adjustments could not be a factor in FNMA default experience.

We are left, however, with several other characteristics of ARM's acquired by FNMA during this period which could have influenced defaults. First is the graduated payment feature. Even without an adjustment in rates, the GPARM could experience negative amortization in the early years of the note. The GPM has been found to have a higher default incidence by the FHA and the private mortgage insurance companies. MGIC has reported a 55 percent higher default rate for GPM's, based upon its insured GPM's originated from 1980-82 and their performance through March 1984. PMI Mortgage Insurance Company found GPM's originated in 1981-82 to default 30 percent more often than the traditional FRM. To the extent that FNMA made substantial GPARM or GPM purchases in the 1981-84 period, there could be some increased risk of default from this source.

A second ARM characteristic which could increase default risk is the initial period discount or buydown. The discount is typically a first-year reduction in the contract rate provided to the borrower, which in turn lowers the borrower's first year monthly payments. The lender then slightly increases the margin or sells at a discount to enable FNMA to achieve its stated yield on purchase. In the past, these discounts were often extreme, and "teaser rates" of 4 percent and less have been reported. The problem created by this discount is one of payment shock. Because the loan is underwritten often with income ratio requirements unaffected by the existence of the discount (i.e., typically 28 percent), the second year's payments can jump to well over 30 percent. The problem is compounded if the discount is tied to a graduated payment mortgage which also has subsequent-year upward payment adjustments. Recent FNMA guideline revisions have reduced these permitted discounts to 50-300 bp, depending on the instrument type.

The buydown, although originating somewhat differently, has the same effect on payment shock, hence on the probability of default. It may be originated by the builder, seller, lender or even a third party and consists of an actual lump sum payment to "buy down" the payments over a stated period. Unlike the discount, the reduction in payment levels is sometimes over a several year period. FNMA has imposed restrictions on the combined effects of the discount and buydown. The evidence presented above indicates that many, if not most, of the loans in FNMA's ARM portfolio have been subject to discounts and buydowns, although those purchased since the revised loan purchase guidelines went into effect in 1983 have been subject to restrictions on the depth of the buydowns and discounts.

We are left therefore with the likelihood that it is the buydown/discount feature which may be responsible for increased ARM defaults during the 1981-84 period. However, it behooves us to ask whether the existence of this feature was unique to ARM's or whether it was also used extensively in FRM's during this period. In fact the latter is the case. Many FRM's originated during the high interest rate period of 1981-82 also were provided buydowns by sellers and builders. We do not have available precise figures as to the relative use of such features between ARM's and FRM's. The fact that FRM rates were typically higher, hence affordability was more of a problem, would suggest that buydowns would be offered more frequently on FRM's. However, as a marketing tool to encourage use of ARM's during a period when spreads against the FRM were inadequate may have encouraged their use for ARM's. We certainly may conclude that both types of instruments employed them extensively, especially during 1981-1982. Theoretically, we would expect the increased default risk generated as a result of a buydown/discount would be no different under an FRM than under an ARM in a stable interest rate environment (and to be higher under an FRM in a declining interest rate environment). Thus we conclude that, apart from the speculative purchase of GPM's or GPARM's, there is little evidence to suggest that the incidence of default under the ARM's purchased by FNMA in the interest rate environment of 1981-84 would be any higher than that for FRM's.[2] Higher defaults were certainly caused by combinations of buydowns and discounts, but these were employed in both FRM s and ARM's. This result is consistent with the limited indirect evidence available comparing ARM and FRM default rates. "The Mortgage Bankers Association of America Third Quarter 1984 Survey of Delinquencies and Default" has found that late payments are coming primarily on FRM's rather than on ARM's.

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[2]There exists, of course, the possibility that default risk differentials could be caused by adverse selection of the ARM or FRM by those most prone toward default. We have very little empirical basis to judge whether this has been the case.

We conclude this section by recalling that the dramatic increase in loan losses by FNMA the last two years was caused primarily by an increase in the per-loan losses. This suggests that equities in the 1983-84 period on foreclosed properties were much lower than in earlier years. This could have been caused in part by reduced inflation, which could have a whip-saw effect on property values driven up in 1981-82 by higher inflationary expectations, especially in markets such as California. It could also, however, have been caused by inadequately taking into account in 1981-82 the inflated estimates of property values which were being created by capitalizing the value of the deep buydown being employed. In both situations, there is no evidence to suggest that ARM's are particularly culpable in this regard. Whether they are potentially responsible for greater default risk in a more adverse interest rate and economic environment than was experienced in 1983-84 will be addressed empirically through simulations later in this paper.

Evaluating Alternative Default Models for Empirical Simulations

In order to assess empirically the increased default potential possessed by various ARM designs, it is necessary to make use of a default model which predicts default levels as a function of the various characteristics of the mortgage instrument which drive default. Numerous default models have been estimated over the last 15 years which estimate the probability of default as a function of a number of variables, including not only characteristics of the mortgage instrument itself, but also of the borrower, the property, the neighborhood, the region, and the general economic environment. However, most of the earlier models, including those of von Furstenberg [1969], Herzog and Earley [1970], Williams et al [1974], Morton [1975], Sandor and Sosin [1975], Gau [1978], Schafer [1978], and Barth et al [1979], are inadequate for the purpose of simulating default probabilities under a variety of alternative mortgage instrument (AMI) designs. This is because their loan-related explanatory variables are specified in such a way that the coefficients estimated would be adequate for FRM simulations only. For example, most of these models included the initial loan-to-value ratio (L_o/V_o), the initial payment-to-income ratio (Q_o/Y_o), and the contract rate (r_o) without any consideration of subsequent differences in contemporaneous measures of these variables under different mortgage instrument designs. These problems are discussed in detail in Swan [1977] and Vandell [1978].

A second generation of default studies, including those of Vandell [1978], Jackson and Kaserman [1980], Webb [1982], Campbell and Dietrich [1983], Cunningham and Hendershott [1983], Foster and Van Order [1983], Lea and Zorn [1983], and Peters et al [1984], attempted to "generalize" the default risk relationship, that is to specify it in such a way that it would be relevant to a variety of instrument designs. Ideally it would be most desirable to estimate such models using loan history data

from a variety of instrument types. However, limited longitudinal experience with AMI's has made this impossible. Therefore, with the exception of Lea and Zorn, who use Canadian rollover mortgage data, all the above models have necessarily been estimated using FRM loan experience, even though they are expected to have implications for AMI's.

Most of these second generation models agree that among those characteristics of the mortgage instrument which are expected to affect defaults in a generalized framework are (1) the contemporaneous loan-to-value or equity-to-value ratio (a borrower would be rational walking away from a property in which he has negative net equity); (2) the payment burden or payment-to-income ratio (in imperfect financial markets a borrower with an adverse change in income or an increase in payment may have difficulty in continuing to make his mortgage payments); and (3) the current mortgage market rate relative to the contract rate on the note (a borrower with a below-market rate has a built-in incentive to continue payment and vice versa). See Vandell [1978], Jackson and Kaserman [1980], Lea and Zorn [1983], and Campbell and Dietrich [1983] for a detailed discussion of these hypothesized effects. These variables can handle most of the ARM features which have developed over time, including buydowns, discounts, negative amortization caused by payment caps or graduated payments, adjustments in payment levels, and rate changes.

There persists some difference of opinion as to the relative importance of these variables in affecting default and their appropriate specification. For example, Foster and Van Order contend that the equity effect dominates, and several of the other studies found mixed effects associated with the payment-to-income ratio. Vandell and Thibodeaux [1984] contend that the effectiveness of the payment-to-income ratio is conditional on the relative cost of borrowing to overcome a cash shortfall and the occurence of "crisis" events unrelated to the nature of the mortgage instrument. Nonetheless, virtually all the studies agree upon the potential influence of the above three variables, whether or not their data base supported their significance.

A review of the generalized default models above resulted in settling on three model specifications which seemed amenable to our purposes. These are (1) the second specification of Campbell and Dietrich, (2) the Peters et al specification, and (3) the Vandell specification for existing homes. Other models were rejected for various reasons, including an insignificant, but negative payment burden effect (which would be inappropriate to include in model simulations), a difficult and time consuming simulation effort (e.g. the Foster and Van Order study), or simulations of FRM default experience which were clearly out of the range of reasonableness.

three model specifications selected are described in Exhibit VII. The reader is referred to the respective studies for a discussion of the development of each model. The Campbell and Dietrich model was estimated through conditional logit analysis using 2.5 million single family mortgages insured by MGIC between 1960 and 1980. Ordinary least squares cohort analysis was applied to the Peters et al data set, which consisted of approximately 503,000 conventional FRM's on 1-4 family owner-occupied houses originated and purchased by the FHLMC between 1973 and 1980. The Vandell model was estimated using ordinary least squares applied to simulation results obtained from the von Furstenberg model.

Note that all of the models include consideration of the contemporaneous loan-to-value or equity-to-value ratio and the contemporaneous payment-to-income ratio (although Campbell and Dietrich and Vandell include only the mortgage payment and not the total housing expense). Of the three, only Campbell and Dietrich include consideration of the ratio of the market rate to the contract rate on the note. In addition Campbell and Dietrich include the initial loan-to-value ratio (as a proxy for wealth), and all the models include "seasoning" variables intended to proxy for "initial borrower effort" (Vandell) or wealth effects. Other non-loan related variables considered include whether or not the house was new (Campbell and Dietrich), whether or not it had a second mortgage (Peters), the unemployment rate in the region (Campbell and Dietrich), and a number of other regional and national economic conditions variables (Peters).

Instrument Designs to be Simulated

It is intended in the simulations to obtain some notion of the extent to which FNMA is currently exposing itself to risk of considerable loss by default through its purchases of ARM's in the event of an adverse interest rate and economic environment. We thus apply the above generalized default models to those instrument designs currently approved for purchase by FNMA[3] under a specific interest rate and economic scenario which is an adverse, though not unrealistic one.

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[3]This necessarily ignores the possibility that the negotiated loan window for nonstandard AMI's is a large one. According to discussions with FNMA personnel, such purchases make up a significant proportion of all loan activity, but deviations from standard loans are typically of minimal importance.

Exhibit VII

Default Simulation Model Descriptions

	Model		
	Campbell and Dietrich (1983)	Peters, et. al. (1984)	Vandell (1978)
Loan Related Variables	L_t/V_t Q_t/Y_t r_{mt}/r_m L_o/V_o	L_t/V_t $Qtot_t/Y_t$ SECMTG	E_t/V_t Q_t/Y_t
Borrower Related Variables		YREMPL	
Property Related Variables	NEW		
Variables Related to Neighborhood and Economy	UNEM	$CREDIT_t$ $MIGRN_t$ $GNP72_t$ REGION	
Other	AGE AGESQ	AGE	AGE

Key to Symbols:

L_t/V_t = contemporaneous loan-to-value ratio
E_t/V_t = contemporaneous equity-to-value ratio
Q_t/Y_t = contemporaneous mortgage payment-to-income ratio
$Qtot_t/Y_t$ = contemporaneous total payment-to-income ratio
r_{mt}/r_a = ratio of current mortgage market rate to contract rate
L_o/V_o = initial loan-to-value ratio
SECMTG = existence of second mortgage
YREMPL = number years employed
NEW = property new
UNEM = regional unemployment
$CREDIT_t$ = net contemporaneous change in consumer credit outstanding
$MIGRN_t$ = net migration in year t
$GNP72_t$ = real gross national product in 1972 dollars in year t
REGION = region of country
AGE, AGESQ = mortgage seasoning variables

The seven standard instrument designs currently approved by FNMA for purchase are described in Exhibit VIII. They include a conventional fixed-rate mortage with or without a buydown; three payment-capped ARM designs approved in September 1983 with permitted graduated payment, buydown, or discount features; and three interest rate-capped ARM designs (5-0, 5-1, and 5-2) approved in October 1984 also with permitted graduated payment buydown, or discount features. Currently, design 5-2, with a one-year Treasury index and adjustment period, a 2 percent annual rate cap, and a 5 percent life-of-loan rate cap is the dominant instrument being sold to FNMA.

Note that these instruments contain a number of restrictions intended to limit credit risk. For example, the maximum loan-to-value ratio for an interest rate-capped GPARM is limited to 90 percent (rather than 95 percent), GPARM's must be offered at a 25 bp yield and margin adjustment (50 bp for the 5-year payment-capped ARM), and GPARM's must be underwritten at a 25 percent total housing expense-to-income ratio (rather than 28 percent). Furthermore, buydowns are limited in duration, type (graduated or level), rate increase, and amount as a proportion of the market value or selling price. They are restricted considerably for GPARM's or eliminated altogether for certain instruments. Interest rate shortfall limits are imposed on all ARM designs and are intended to restrict the use of deep discounts and "teaser rates." Payment caps are restricted to 7.5 percent annually, and annual rate caps to 1 or 2 percent. The life-of-loan rate cap is restricted to 5 percent above the original index plus margin. Finally, the outstanding loan balance in any of the loans is never permitted to go above 125 percent of the original loan amount.

However, in spite of the apparent restrictiveness of these various limitations, there are still left some features of these instruments which could potentially result in considerable payment burden and rate increases and limited net equity under the wrong combination of events. This could in turn adversely affect default. For example, one often-neglected requirement inherent in the ARM designs is the requirement that if the outstanding loan balance is expected to surpass the 125 percent limit, the payment will be immediately raised to the level necessary to fully amortize the note over the remaining term, regardless of the 7.5-percent payment increase limitation. In addition, discounts and buydowns do not affect the income ratio requirements for underwriting for any instrument. Under the permitted discount/buydown limits it is possible for a borrower to experience considerable payment shock after the one-year discounted payment period. Finally, under the permitted restrictions on payment increases and graduated payments, it is very possible under a steep increase in interest rates that the 125 percent loan balance ceiling could be hit very quickly. The extent to which these potential events seriously affect default rates and post-default yields on the various instruments is

Exhibit VIII

Characteristics of Approved FNMA Loans for Purchase
Relevant to Simulations

	Conventional Fixed Rate First Mortgages
Maximum Loan-to-Value Ratios	95% owner-occupied first residence 90% owner-occupied refinance 80% second home or investment property
Loan Term	Maximum 30 years
Underwriting	Standard FNMA underwriting criteria (Max 28% monthly housing expense to income and 36% total obligations to income)
Eligible Buydowns	Period: 1 to 10 years in 12-month increments, 5 years if employee relocation plan. Type: level buydown or graduated buydown (must be constant each 12-month period) Rate increase: for graduated buydowns, interest rate cap 1%/yr. over buydown periods, level buydowns, cumulative rate increases capped at 2% Source: any source or combination (seller, builder, borrower, employer)
Seller Buydown Limit	Seller's cash contribution limited to 6% of lesser of sales price or appraised value if L/V>90% 10% if L/V<=90%.
Negotiated Transactions	On a negotiated basis will consider purchase of nonstandard mortgages

Exhibit VIII (Continued)

Adjustable Rate Mortgages

Standard Plan	1-Year ARM	3-Year ARM	5-Year ARM
Interest Rate Index	1-yr Treasury Securities (wkly)	3-yr Treasury Securities (wkly)	5-yr Treasury Securities (wkly)
Interest Rate and Payment Adjustment Intervals	Every 1 year	Every 3 years	Every 5 years
Payment Caps	7.5 percent annually	7.5 percent at adjust. per. Increases until amort. @ 7.5%	Same as 3 yr.
Graduated Payment Option			
Period	3 yr	3 yr	5 yr
Terms	7.5% annual increase	Same	Same
Yld and Mgn Adj.	+1/4%	+1/4%	+1/2%
Permanent Buydowns	Eligible as reduc. of margin	Same	Same
Temporary Buydowns	Not eligible	Eligible. Must expire 12 mo. before init. payment adjustment. For GPARM's only if used to reduce deferred interest.	Same as 3-yr.
Maximum Loan-to-Value Ratio	95% owner occupied, 90% owner occupied refinance, 80% second home or investment prop.		
Deferred Interest	Unpaid balance cannot exceed 125% of original loan amount.		
Interest Rate Shortfall Limits	250 bp GPARM: 50 bp	275 bp GPARM: 50 bp	300 bp GPARM: 50 bp

Exhibit VIII (Continued)

	Interest Rate-Capped Adjustable Rate Mortgage		
Three Standard Plans	5-0	5-1	5-2
Interest Rate Index	1-yr Treasury Securities (wkly)	Same	Same
Interest Rate and Payment Adjustment Intervals	Every year	Same	Same
Lifetime Rate Cap	Maximum of 5% above initial note rate	Same	Same
Annual Rate Cap	N/A	1%	2%
Payment Cap	7.5% Annually	N/A	N/A
Conversion to Field Rate Option	3rd, 4th, 5th yr. interest change dates	Same	Same
Graduated Payment Option			
Period	3 years	Same	Same
Terms	7.5% annual increase	Same	Same
Yld and Mgn Adj.	+1/4%	+1/4%	+1/4%
Permanent Buydowns	Eligible as permanent reduction of margin	Same	Same
Temporary Buydowns	Not eligible	Eligible 1% in 1st yr only	Not eligible
Maximum Loan-to-Value Ratio	Owner occupied principal residence 95% for ARM, 90% for GPARM; owner occupied refinance 90%; second home or investment prop. 80%		

Exhibit VIII (Continued)

Interest Rate-Capped ARM's (continued)

	5-0	5-1	5-2
Deferred Interest	Total unpaid principal balance cannot exceed 125% of original loan amount		
Seller Buydown Limit	Seller's cash contribution limited to: 6% of lesser of sales price or appraised value if L/V>90% 10% of lesser of sales price or appraised value if L/V<=90%. Limits apply to total contribution if both temporary buydown and interest shortfall exist. If in excess, must adjust sales price to reflect concession.		
Interest Rate Shortfall Limits	250 bp GPARM: 50 bp	125 bp GPARM: 50 bp	250 bp GPARM: 50 bp

dependent on the way in which these changes in payment burden, note rates, and net equity work their way through the default models and the way the timing of default works its way through to affect yields after normal prepayment.[4] Our simulations were designed to take this next step.

Simulation Assumptions

The assumptions used in the simulations of the instruments and default models described above are summarized in Exhibit IX. The intent is to use current pricing practice for the various instruments as a base and to examine the extent to which encountering an adverse interest rate and economic environment would affect each instrument, both with respect to the increase in default levels over time and with respect to the impact on post-default yields.

We assume that the initial contract rate on the FRM and FRM with a buydown is 13 percent -- close to the current yield in the marketplace. The current (as of the week of January 20-26, 1984) spread between the yield on the conventional fixed-rate mortgage and the various ARM designs quoted by FNMA is used as the basis to determine the index-rate-plus-margin for each instrument. These are shown in Exhibit IX. A 25 bp premium for the required yield is assumed for each GPARM simulated in comparison to its counterpart ARM yield, as required by the FNMA guidelines.

It is assumed for each instrument that the maximum permissible buydown/discount combination is acquired by the borrower. FNMA restrictions for interest shortfalls are intended to apply to any combination of buydowns and discounts. Since these exceeded the permissible buydown levels alone, we include in the simulations the maximum permitted first year discounts only.

Several loan-to-value ratios are assumed. To extract a "worst case" estimate, the loan-to-value ratio is first assumed to be at the maximum permitted level -- 95 percent for all loans except the interest rate-capped GPARM's which may only assume a maximum of 90 percent. An 80 percent L/V is also simulated as a "typical" loan.

The total housing expense-to-income ratios are also assumed to be at their maximum permitted levels according to FNMA underwriting guidelines -- 28 percent for all instruments except the GPARM's and 25 percent for the GPARM's. It is assumed that insurance and property tax payments make up 2 percent of the current market value of the property each year.

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[4]This suggests that the timing of default as well as its likelihood is important in determining default losses. See Altman et al [1981] for a discussion of this issue.

Exhibit IX

Assumptions for Default Simulations

Instrument	Initial Index + Margin (%)	Loan-to-Value Ratio	Hsg. Exp.-to-Income Ratio	Initial Period Discount	Trend in V,Y
FRM	13	.8,.9,.95	.28	—	+5%,0
FRM w/ Buydown	13	.8,.9,.95	.28	6%,10%V	+5%,0
Payment Capped ARM					
1 year	10.4	.8,.95	.28	250bp	+5%.0
3 year	12.1	.8,.95	.28	275bp	+5%,0
5 year	12.85	.8,.95	.28	300bp	+5%,0
Payment Capped GPARM					
1 year	10.65	.8,.95	.25	50bp	+5%,0
3 year	12.35	.8,.95	.25	50bp	+5%,0
5 year	Not Undertaken				
Interest Rate Capped ARM					
5-0	11.10	.8,.95	.28	250bp	+5%,0
5-1	11.55	.8,.95	.28	125bp	+5%,0
5-2	11.40	.8,.95	.28	250bp	+5%,0
Interest Rate Capped GPARM					
5-0	11.35	.8,.9	.25	50bp	+5%,0
5-1	11.80	.8,.9	.25	50bp	+5%,0
5-2	11.65	.8,.9	.25	50bp	+5%,0

Initial Income Level: $40,000

Initial House Price: That necessary to result in maximum Q/Y for given Y and L/V.

Default Model Parameters: All non-loan related variables set to average values. Loan rate ratio assumes borrower could refinance at current market rate for given instrument type.

Interest Rate Scenario: Rise in index rate at 250 bp per year to max of 700 bp above initial rate.

Initial borrower income is assumed to be $40,000 in all simulations. This is essentially an arbitrary figure, as none of the results depend upon absolute dollars of income but only on the payment-to-income ratio. Given the initial borrower income, housing expense-to-income ratio, loan-to-value ratio, and mortgage type and terms, the loan amount and house value is then predetermined. Note that we implicitly are assuming that borrower demand elasticities are such that, when offered an alternative to the FRM, the borrower will opt again to buy as much house and obtain as large a loan as possible. This is certainly a better assumption than assuming the demand for housing and mortgage credit remains static, but of course is not exactly correct. It nonetheless is the conventional assumption for simulations of this type and will be the conventional assumption throughout our analysis.

Our "base" economic scenario assumes both incomes and property values rise at a 5-percent nominal rate. However, we also simulate default performance when either incomes, or property values, or both are static. In the latter cases, payment burdens and loan-to-value ratios can reach relatively high levels, and we wish to examine their impact on defaults.

All non-loan related variables in each default model are assumed always to be at their average level. This assumption removes the possibility of an interactive influence on default of these variables with the loan-related variables. However, since the default models were all estimated using different data sets and estimation methodologies, this means that default predictions under each model could be displaced from each other model by a constant. Furthermore, it is assumed the rate ratio variable in the Campbell and Dietrich model is defined by the current market rate for the given instrument type (rather than for the FRM) relative to the current amortization rate on the note.

Finally, our intent in selecting an appropriate "adverse" interest rate scenario, to be used in all runs, is to select a rate of increase and maximum interest rate level which is pessimistic but realistically possible. We selected an increase in the index of 2.5 percentage points per year (a rate which has also been used by FNMA in its "worst case" scenario in its Consumer Guide to ARM's) and a maximum increase of 7 percentage points (which is higher than the 5-percent life-of-loan cap but reflects a similar run-up in rates during the 1977-81 period). Whether or not such a high rate would persist over the life of the loan is questionable, but the impact of this assumption on maximum default rates and yields is less than might be thought because it is effective past the point of maximum default risk and acts later in the future upon more greatly discounted dollars. Note that to some extent in our simulations we are comparing apples to oranges in that an economic scenario which

would drive a 1-year index up 2.5 percent per year is not typically the same scenario which would drive a 3 or 5-year index up the same amount.

The above assumptions are intended only to establish a realistic pessimistic scenario to test how various ARM designs would perform, given the current pricing environment. They are not intended to predict what type of future interest rate and economic environment actually will occur; we leave that to econometric modeling efforts. Nor are they intended in any way to take into account the covariance which may exist among various interest rate, property value, and income trends and use this to price the ARM's. That exercise is left ultimately to the various options pricing efforts currently under way (see for example Epperson et al [1984] and Cunningham and Hendershott [1983]).

Simulation Results

We turn finally to the results from the 49 simulation runs made according to the above scenarios. These are summarized in Exhibits X through XII by instrument type, by buydown or discount level, by income and property value trend assumption, by initial loan-to-value ratio, and by default model used in the simulation. Two basic sets of results were obtained. The first is the predicted trend in annual conditional default rates over time. We have summarized these in the first three columns of each table by the maximum annual default rate predicted to be incurred under each run. The second is the "yield differential," the difference between the yield to maturity of the note under zero default (i.e. paying all contracted payments, given subsequent interest rate movements) and the yield to maturity of the note under the predicted trend in conditional default rates. This latter post-default yield measure is defined by the expression:

$$L_o = \sum_{t=1}^{T} \frac{Q_t \prod_{i=1}^{t} (1-d_i)}{(1 + YIELD)^t}$$

where:

L_o = Original loan amount
T = Note maturity
Q_t = Contracted loan payment in period t
d_i = Predicted conditional default rate in period i
YIELD = post-default yield to maturity of the note

The yield differential is a convenient approximation to a discounted average annual default rate over the contracted maturity of the note. The yield differential is represented in the second three columns of each table.

Note the following with respect to these measures of predicted default risk:

--We have effectively assumed zero prepayment over the contracted loan maturity. Thus we may be somewhat overstating the actual default effect on post-default yields. However, this effect is expected to be minimal unless prepayments come very early because default rates tend to be quite low in later periods and their effects are discounted considerably. Nonetheless, this points to the necessity of ultimately considering ARM effects on prepayments as well as on defaults in order to more accurately predict yields under the ARM.

--We have effectively assumed zero recovery of any of the outstanding loan balance when default occurs and thus have overstated the impact of default on yields. It is true of course that some proportion of the balance is recovered, and this proportion varies with economic conditions and transactions costs. This points to the additional necessity of estimating loan losses over time as a function of economic conditions, transactions costs, and (possibly) instrument type.

Exhibit X

Default Simulations:
Maximum Default Rates and Yield Differentials

Loan Type	Loan-to-Value Ratio	Maximum Default Rate			Yield Differential		
		Campbell & Dietrich	Peters	Vandell	Campbell & Dietrich	Peters	Vandell
FRM							
	0.95	0.0098	0.0026	0.0033	0.0070	0.0012	0.0014
	0.9	0.0094	0.0025	0.0016	0.0067	0.0011	0.0008
	0.8	0.0085	0.0023	0.0006	0.0060	0.0010	0.0003
LEVEL V	0.95	0.0136	0.0028	0.0107	0.0091	0.0015	0.0083
LEVEL Y	0.95	0.0128	0.0043	0.0036	0.0086	0.0041	0.0017
LEVEL BOTH	0.95	0.0178	0.0045	0.0165	0.0113	0.0042	0.0128
FRM WITH BUYDOWN							
	0.95	0.0119	0.0044	0.0031	0.0076	0.0025	0.0015
	0.9	0.0112	0.0043	0.0017	0.0072	0.0025	0.0009
	0.8	0.0101	0.0040	0.0006	0.0064	0.0023	0.0003
5-1 WITH DISCOUNT OF 125 BP							
	0.95	0.0163	0.0049	0.0034	0.0102	0.0035	0.0018
	0.8	0.0138	0.0046	0.0007	0.0086	0.0032	0.0004
LEVEL V	0.95	0.0222	0.0052	0.0194	0.0134	0.0038	0.0139
LEVEL Y	0.95	0.0238	0.0111	0.0039	0.0141	0.0074	0.0023
LEVEL BOTH	0.95	0.0332	0.0086	0.0336	0.0188	0.0074	0.0228
5-2 WITH DISCOUNT OF 250 BP							
	0.95	0.1080	0.0071	0.0037	0.0120	0.0048	0.0022
	0.8	0.0152	0.0067	0.0009	0.0101	0.0044	0.0005
LEVEL V	0.95	0.0244	0.0073	0.0225	0.0156	0.0050	0.0169
LEVEL Y	0.95	0.0272	0.0129	0.0048	0.0171	0.0091	0.0028
LEVEL BOTH	0.95	0.0380	0.0099	0.0388	0.0227	0.0090	0.0273
5-0 WITH DISCOUNT OF 250 BP							
	0.95	0.0216	0.0066	0.0049	0.0128	0.0045	0.0030
	0.8	0.0180	0.0062	0.0011	0.0107	0.0045	0.0007
LEVEL V	0.95	0.0311	0.0070	0.1025	0.0175	0.0052	0.0542
LEVEL Y	0.95	0.0349	0.0146	0.0064	0.0190	0.0096	0.0041
LEVEL BOTH	0.95	0.0514	0.0118	0.1745	0.0267	0.0095	0.0954

Exhibit X (Continued)

Default Simulations:
Maximum Default Rates and Yield Differentials

Loan Type	Loan-to-Value Ratio	Maximum Default Rate			Yield Differential		
		Campbell & Dietrich	Peters	Vandell	Campbell & Dietrich	Peters	Vand
5-0 GPARM WITH DISCOUNT OF 50 BP							
	0.9	0.0255	0.0077	0.0091	0.0128	0.0041	0.0038
	0.8	0.0220	0.0073	0.0030	0.0112	0.0038	0.0013
LEVEL V	0.9	0.0364	0.0081	A	0.0183	0.0044	A
LEVEL Y	0.9	0.0402	0.0144	0.0140	0.0195	0.0086	0.0056
LEVEL BOTH	0.9	0.0602	0.0123	A	0.0288	0.0086	A
1-YEAR ARM PAYCAP WITH DISCOUNT OF 250 BP							
	0.95	0.0282	0.0088	0.0069	0.0154	0.0060	0.0045
	0.8	0.0231	0.0083	0.0015	0.0126	0.0055	0.0010
LEVEL V	0.95	0.0472	0.0093	A	0.0225	0.0063	A
LEVEL Y	0.95	0.0614	0.0194	0.0112	0.0257	0.0114	0.0068
LEVEL BOTH	0.95	0.1027	0.0167	A	0.0394	0.0114	A
3-YEAR ARM PAYCAP WITH DISCOUNT OF 275 BP							
	0.95	0.0315	0.0088	0.0072	0.0143	0.0052	0.0038
	0.8	0.0253	0.0083	0.0016	0.0118	0.0047	0.0008
LEVEL V	0.95	0.0443	0.0094	A	0.0210	0.0056	A
LEVEL Y	0.95	0.0624	0.0180	0.0127	0.0239	0.0103	0.0057
LEVEL BOTH	0.95	0.0993	0.0158	A	0.0368	0.0104	A
1-YEAR GPARM PAYCAP WITH DISCOUNT OF 50 BP							
	0.95	0.0300	0.0094	0.0175	0.0158	0.0050	0.0066
	0.8	0.0242	0.0088	0.0033	0.0129	0.0046	0.0013
LEVEL V	0.95	0.0428	0.0097	A	0.0226	0.0054	A
LEVEL Y	0.95	0.0491	0.0157	0.0250	0.0253	0.0098	0.0093
LEVEL BOTH	0.95	0.0739	0.0136	A	0.0374	0.0099	A
5-YEAR ARM PAYCAP WITH DISCOUNT OF 300 BP							
	0.95	0.0209	0.0073	0.0036	0.0113	0.0044	0.0022
	0.8	0.0175	0.0069	0.0009	0.0095	0.0040	0.0005
LEVEL V	0.95	0.0362	0.0079	A	0.0164	0.0048	A
LEVEL Y	0.95	0.0471	0.0176	0.0058	0.0180	0.0093	0.0033
LEVEL BOTH	0.95	0.0814	0.0156	A	0.0274	0.0094	A

A - ANOMOLOUS RESULT: HIGH L/V UNDER VANDELL MODEL

Exhibit XI

Default Simulations:
Ranking of Maximum Default Rates and Yield Differentials
Relative to FRM Performance

Loan Type	Loan-to-Value Ratio	Rank Maximum Default Rate (Lowest = 1)			Rank Yield Differential (Lowest = 1)		
		Campbell & Dietrich	Peters	Vandell	Campbell & Dietrich	Peters	Vandell
FRM							
	0.95	1	1	2	1	1	1
	0.8	1	1	1	1	1	1
LEVEL V	0.95	1	1	1	1	1	1
LEVEL Y	0.95	1	1	1	1	1	1
LEVEL BOTH	0.95	1	1	1	1	1	1
FRM WITH BUYDOWN							
	0.95	2	2	1	2	2	2
	0.8	2	2	2	2	2	2
LEVEL V	0.95	*	*	*	*	*	*
LEVEL Y	0.95	*	*	*	*	*	*
LEVEL BOTH	0.95	*	*	*	*	*	*
5-1 WITH DISCOUNT OF 125 BP							
	0.95	3	3	3	3	3	3
	0.8	3	3	3	3	3	3
LEVEL V	0.95	3	3	3	3	3	3
LEVEL Y	0.95	3	3	3	3	3	3
LEVEL BOTH	0.95	3	3	3	3	3	3
5-2 WITH DISCOUNT OF 250 BP							
	0.95	4	5	5	5	6	4
	0.8	4	5	5	5	6	4
LEVEL V	0.95	4	5	4	4	6	4
LEVEL Y	0.95	4	4	4	4	5	4
LEVEL BOTH	0.95	4	4	4	4	5	4
5-0 WITH DISCOUNT OF 250 BP							
	0.95	6	4	6	7	7	6
	0.8	6	4	6	6	7	6
LEVEL V	0.95	5	4	5	6	7	5
LEVEL Y	0.95	5	6	6	6	7	5
LEVEL BOTH	0.95	5	5	5	5	7	5

*NOT ESTIMATED. ASSUMED TO RANK SECOND BEHIND FRM

Exhibit XI (Continued)

Default Simulations:
Ranking of Maximum Default Rates and Yield Differentials
Relative to FRM Performance

Loan Type	Loan-to-Value Ratio	Rank Maximum Default Rate (Lowest = 1)			Rank Yield Differential (Lowest = 1)		
		Campbell & Dietrich	Peters	Vandell	Campbell & Dietrich	Peters	Vandell
5-0 GPARM WITH DISCOUNT OF 50 BP							
	0.9	7	7	9	6	4	8
	0.8	7	7	9	7	4	9
LEVEL V	0.9	7	7	A	7	4	A
LEVEL Y	0.9	6	5	9	7	4	7
LEVEL BOTH	0.9	6	6	A	7	4	A
1-YEAR ARM PAYCAP WITH DISCOUNT OF 250 BP							
	0.95	8	8	7	9	10	9
	0.8	8	8	7	9	10	8
LEVEL V	0.95	10	8	A	9	10	A
LEVEL Y	0.95	9	10	7	10	10	9
LEVEL BOTH	0.95	10	10	A	10	10	A
3-YEAR ARM PAYCAP WITH DISCOUNT OF 275 BP							
	0.95	10	9	8	8	9	7
	0.8	10	9	8	8	9	7
LEVEL V	0.95	9	9	A	8	9	A
LEVEL Y	0.95	10	9	8	8	9	8
LEVEL BOTH	0.95	9	9	A	8	7	A
1-YEAR GPARM PAYCAP WITH DISCOUNT OF 50 BP							
	0.95	9	10	10	10	8	10
	0.8	9	10	10	10	8	10
LEVEL V	0.95	8	10	A	10	8	A
LEVEL Y	0.95	8	7	10	9	8	10
LEVEL BOTH	0.95	7	7	A	9	8	A
5-YEAR ARM PAYCAP WITH DISCOUNT OF 300 BP							
	0.95	5	6	4	4	5	5
	0.8	5	6	4	4	5	5
LEVEL V	0.95	6	6	A	5	5	A
LEVEL Y	0.95	7	8	5	5	6	5
LEVEL BOTH	0.95	8	8	A	6	6	A

A - ANOMOLOUS RESULT: HIGH L/V UNDER VANDELL MODEL

Exhibit XII

Default Simulations:
Ratio of Maximum Default Rates and Yield Differentials to FRM Base

Loan Type	Loan-to-Value Ratio	Ratio of Maximum Default Rate			Ratio of Yield Differential		
		Campbell & Dietrich	Peters	Vandell	Campbell & Dietrich	Peters	Vandell
FRM							
	0.95	1.000	1.000	1.000	1.000	1.000	1.000
	0.9	1.000	1.000	1.000	1.000	1.000	1.000
LEVEL V	0.8	1.000	1.000	1.000	1.000	1.000	1.000
LEVEL Y	0.95	1.000	1.000	1.000	1.000	1.000	1.000
LEVEL BOTH	0.95	1.000	1.000	1.000	1.000	1.000	1.000
FRM WITH BUYDOWN							
	0.95	1.202	1.671	0.937	1.078	2.052	1.068
	0.9	1.199	1.700	1.059	1.076	2.130	1.081
	0.8	1.190	1.743	1.066	1.072	2.311	1.105
5-1 WITH DISCOUNT OF 125 BP							
	0.95	1.654	1.883	1.011	1.451	2.793	1.281
	0.8	1.631	1.978		1.439	3.203	1.347
LEVEL V	0.95	1.634	1.810	1.812	1.476	2.397	1.669
LEVEL Y	0.95	1.856	2.556	1.085	1.621	1.774	1.329
LEVEL BOTH	0.95	1.867	1.905	2.026	1.661	1.746	1.784
5-2 WITH DISCOUNT OF 250 BP							
	0.95	1.828	2.715	1.126	1.705	3.808	1.562
	0.8	1.791	2.885	1.504	1.676	4.442	1.646
LEVEL V	0.95	1.799	2.550	2.105	1.722	3.178	2.023
LEVEL Y	0.95	2.122	2.973	1.346	1.974	2.173	1.624
LEVEL BOTH	0.95	2.135	2.199	2.340	1.998	2.126	2.134
5-0 WITH DISCOUNT OF 250 BP							
	0.95	2.183	2.516	1.474	1.823	3.936	2.181
	0.8	2.119	2.673	1.840	1.777	4.591	2.199
LEVEL V	0.95	2.290	2.427	9.557	1.924	3.318	6.469
LEVEL Y	0.95	2.730	3.363	1.790	2.194	2.292	2.394
LEVEL BOTH	0.95	2.886	2.601	10.522	2.351	2.254	7.442

Exhibit XII (Continued)

Default Simulations:
Ratio of Maximum Default Rates and Yield Differentials to FRM Base

Loan Type	Loan-to-Value Ratio	Ratio of Maximum Default Rate			Ratio of Yield Differential		
		Campbell & Dietrich	Peters	Vandell	Campbell & Dietrich	Peters	Vandell
5-D GPARM WITH DISCOUNT OF 50 BP							
	0.9	2.579	2.921	2.723	1.814	3.244	2.704
	0.8	2.596	3.153	5.160	1.860	3.819	3.966
LEVEL V	0.9	2.674	2.819	A	2.009	2.827	A
LEVEL Y	0.9	3.137	3.331	3.869	2.248	2.052	3.205
LEVEL BOTH	0.9	3.379	2.721	A	2.537	2.045	A
1-YEAR ARM PAYCAP WITH DISCOUNT OF 250 BP							
	0.95	2.853	3.321	2.067	2.187	4.741	3.236
	0.8	2.727	3.547	2.653	2.105	5.556	3.196
LEVEL V	0.95	3.468	3.231	A	2.470	4.004	A
LEVEL Y	0.95	4.792	4.472	3.099	2.962	2.734	3.917
LEVEL BOTH	0.95	5.766	3.687	A	3.465	2.702	A
3-YEAR ARM PAYCAP WITH DISCOUNT OF 275 BP							
	0.95	3.186	3.355	2.149	2.032	4.172	2.678
	0.8	2.976	3.552	2.696	1.963	4.791	2.528
LEVEL V	0.95	3.258	3.264	A	2.308	3.576	A
LEVEL Y	0.95	4.873	4.143	3.517	2.755	2.473	3.296
LEVEL BOTH	0.95	5.576	3.497	A	3.236	2.465	A
1-YEAR GPARM PAYCAP WITH DISCOUNT OF 50 BP							
	0.95	3.038	3.565	5.218	2.242	4.023	4.667
	0.8	2.855	3.776	5.520	2.146	4.625	3.969
LEVEL V	0.95	3.145	3.390	A	2.488	3.454	A
LEVEL Y	0.95	3.838	3.634	6.911	2.913	2.359	5.359
LEVEL BOTH	0.95	4.149	3.010	A	3.290	2.353	A
5-YEAR ARM PAYCAP WITH DISCOUNT OF 300 BP							
	0.95	2.121	2.773	1.088	1.610	3.500	1.607
	0.8	2.068	2.961	1.501	1.582	4.055	1.770
LEVEL V	0.95	2.662	2.767	A	1.801	3.039	A
LEVEL Y	0.95	3.681	4.052	1.619	2.073	2.231	1.923
LEVEL BOTH	0.95	4.573	3.446	A	2.413	2.222	A

A - ANOMOLOUS RESULT: HIGH L/V UNDER VANDELL MODEL

These two qualifications together suggest that the yield differentials predicted should be taken as upper bounds of the potential losses due to default. Comparisons of ARM performance with FRM performance must be made with this in mind.

One of the first clear results from observing Exhibits X through XII is that, although the various default models predict some differences in the absolute default probabilities, the relative effects (in comparison to the FRM) and expecially instrument rankings are surprisingly consistent. Given the differences in data sets used in estimation, estimation periods, and estimation methodologies, this consistency was comforting and provided greater confidence in the results.

There were some exceptions, however, to satisfactory model performance. The Vandell model was very sensitive to the net equity variable and predicted extremely high default levels for loan-to-value ratios approaching unity. This resulted from a problem in the specification of this model, which entered the variable in log form, predicting the probability of default to be in excess of 100 percent. Thus, the Vandell model results are considered inaccurate for those simulations in which relatively low (or negative) net equities are predicted, although the model performed well in "average" situations. The Peters model suffered from the opposite problem. Absolute default levels seemed insensitive to all loan-related effects. However, in terms relative to FRM performance (Exhibit VII), the Peters model still performed comparable to the other models.

A second major result of note is that, under our specified scenarios, default levels are expected to increase under all of the various ARM designs (including the FRM buydown option) in comparison to expected default rates under the FRM. The worst performing instruments in all interest rate and economic scenarios tended to be the payment capped ARM's, in particular the 3-year, the 1-year, and the 1-year payment capped GPARM. These instruments were predicted for the 95 percent loan base case to have maximum annual default rates between 107 and 421 percent higher than under the FRM (depending on the default model chosen). Yield differentials for the instrument were predicted to be between 103 and 374 percent higher[5]. This result was expected, to some extent, since under the payment-capped instruments there is no interest rate cap and negative amortization can con very rapidly and soon reach the 125 percent limit, forcing escalation in payments and payment shock. The graduated payment feature and the first year discount only magnify this problem by increasing the payment shock and further slowing the

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[5]The variations are due to variations among predictions across default models. When the models are ranked (Exhibit XI), however, the rankings of instruments are very consistent across default models.

rate of loan amortization. The 3-year instrument performed worse than the 1-year instrument because of the more rapid accumulation of deferred interest in the first three years caused by the longer payment cap period.

Although we have less confidence in the absolute magnitudes of predicted default rates due to the variations in the default models employed, we note that in the 95 percent loan base case maximum annual default levels are predicted to increase from between 0.27 and 0.99 percent under the FRM to between 0.70 and 3.15 percent under the shorter term payment-capped instruments. Predicted yield differentials increase from between 0.12 and 0.71 percent under the FRM to between 0.38 and 1.58 percent under the shorter term payment-capped instruments.

The interest-rate capped instruments are predicted to perform significantly better than the shorter term payment-capped instruments, though still to possess higher default expectations than the FRM. The worst performing instruments within this group again appear to be those with some payment-cap features forcing negative amortization, expecially with the graduated-payment option. The 5-0 GPARM is predicted to experience maximum annual default rates of between 0.77 and 2.55 percent and yield differentials of between 0.38 and 1.28 percent. These represent maximum annual default rate increases over FRM rates of between 158 and 192 percent and yield differential increases of between 81 and 224 percent.

The 5-0 instrument without the graduated payment option is the second-worst performing instrument in this group, followed by the 5-2 instrument (2 percent annual, 5 percent life-of-loan rate cap) and the 5-1 instrument (1 percent annual, 5 percent life-of-loan rate cap). The relative performance of these instruments is expected because the more severe annual interest rate adjustment constraint under the 5-1 instrument restricts the impact of a rapid run-up of interest rates on the payment burden and rate of loan amortization. The 5-1 loan is predicted to experience maximum annual default rates of between 0.34 and 1.64 percent and yield differentials of between 0.18 and 1.03 percent, which represent increases over FRM levels of only between 1 and 88 percent and between 28 and 179 percent respectively. This instrument performed consistently third in the rankings (Exhibit XI) behind the two fixed-rate instruments. The 5-2 loan maximum default rates are predicted to be between 13 and 172 percent higher than the FRM rates (average 89 percent) and the yield differential between 56 and 281 percent (average 136 percent) higher. To the extent that this instrument is dominating current purchases, this could approximate FNMA default experience on their ARM loans in an adverse interest rate environment.

The 5-year payment-capped ARM is predicted to perform considerably better than the other payment-capped instruments and comparable to the 5-0 and 5-2 among the interest-rate capped instruments. Maximum default rates for this instrument are predicted to be between 9 and 177 percent higher than comparable FRM default rates, and yield differentials are predicted to be between 61 and 250 percent higher. This instrument's improved performance relative to the shorter term payment-capped instruments is caused by the longer period of constrained level payment which offsets the effects of rapid negative amortization and of payment shock caused by escalating to fully amortizing payment levels upon hitting the 125 percent loan balance constraint.

The FRM with the 6-to-10 percent buydown option ranks consistently second in its predicted default performance relative to the FRM. Maximum annual default rates of between 0.32 and 1.19 percent and yield differentials of between 0.15 and 0.76 percent are predicted. These represent increases over FRM levels of only between -0.6 percent and 67 percent (average 27 percent) and between 7 and 105 percent (average 40 percent) respectively. These increases are within the ranges currently being experienced under the GPM and resemble the increased rates of default being experienced by FNMA, which seem to be driven primarily by FRM buydowns. It should be noted that relative default experience under this instrument is not expected to be directly influenced by the interest rate scenario chosen, since both the FRM and FRM/buydown are fixed-rate instruments, but only by the loan-to-value ratio and income and house value trends.

Turning our attention to the other simulation runs besides the 95-percent loan base case suggests that the relative default performance of the various instruments does not seem to be highly sensitive to either the loan-to-value ratio or to trends in property values and income. The rankings in Exhibit XI remain relatively consistent throughout. There is a strong indication that, although absolute default levels would be expected to increase under a higher loan-to-value ratio or lower income or value trend (for example, maximum annual default rates are predicted to increase to over 8 percent among the payment-capped instruments), it does not appear to be the case that these instruments' relative desirability tends to vary significantly with these variables.

One additional question of interest which our simulations were intended to answer is whether, in spite of the fact that absolute default rates are predicted to be higher under the various ARM's, this necessarily implies that expected net (post-default) yields will be lower. If such is the case, then the risk to the soundness of FNMA's ARM portfolio is potentially threatened. If however, the yield flexibility of the ARM

designs results in both higher gross (pre-default) and net (post-default) yields in an adverse interest rate environment, then there is some suggestion that, from the standpoint of credit risk, the increased risks are at least being partially compensated for by increased returns.

In Exhibits XIII and XIV we attempt in a relatively simple and straightforward manner to get at this question of the extent to which reductions in interest rate risk inherent in FNMA's purchases of ARM's are offset by increases in default risk. In Exhibit XIII we indicate the predicted gross (pre-default) yield under each instrument and the predicted net (post-default) yields for each run. The net yield has been defined previously and is simply the gross yield less the yield differential. Exhibit XIV compares these net yields in terms relative to the net yields under the FRM. We note the following results:

First it is clear that, in the current pricing environment and under the assumed interest rate scenario, gross yields are predicted to be higher under all the ARM's. Those with the highest predicted gross yields, as expected, are the payment-capped instruments which are permitted to adjust fully to their Treasury indices. The 3-year ARM and the 1-year GPARM rank the highest at 16.22 and 15.90 percent respectively. Note that these also tend to be the instruments with the highest predicted risk of default. Those with the lowest predicted gross yields, on the other hand, are the interest-rate capped instruments with generally lower risks of default (although there are exceptions --the 5-year payment-capped instrument has the third highest predicted gross yield in spite of the fact that its predicted default risk is more moderate, and the 5-0 interest-rate capped instrument has a lower predicted gross yield than the 5-2 instrument in spite of the fact its default risk is predicted to be higher). These relationships are plotted in Exhibit XV.

Exhibit XIII

Default Simulations:
Net (Post-Default) Yields
(Zero-Default Yield to Maturity Less Yield Differential)

Loan Type	Loan-to-Value Ratio	Net (Post-Default) Yield: Campbell & Dietrich	Peters	Vandell
FRM (Pre-Default Yield = 0.1300)				
	0.95	0.1229	0.1287	0.1285
	0.9	0.1232	0.1288	0.1291
	0.8	0.1239	0.1289	0.1296
LEVEL V	0.95	0.1208	0.1284	0.1216
LEVEL Y	0.95	0.1213	0.1258	0.1282
LEVEL BOTH	0.95	0.1186	0.1257	0.1171
FRM WITH BUYDOWN (Pre-Default Yield = 0.1214)				
	0.95	0.1138	0.1188	0.1199
	0.9	0.1142	0.1189	0.1205
	0.8	0.1149	0.1191	0.1210
5-1 WITH DISCOUNT OF 125 BP (Pre-Default Yield = 0.1458)				
	0.95	0.1356	0.1423	0.1440
	0.8	0.1372	0.1420	0.1454
LEVEL V	0.95	0.1324	0.1420	0.1319
LEVEL Y	0.95	0.1317	0.1384	0.1435
LEVEL BOTH	0.95	0.1270	0.1384	0.1230
5-2 WITH DISCOUNT OF 250 BP (Pre-Default Yield = 0.1483)				
	0.95	0.1363	0.1435	0.1461
	0.8	0.1382	0.1439	0.1478
LEVEL V	0.95	0.1326	0.1433	0.1314
LEVEL Y	0.95	0.1312	0.1392	0.1455
LEVEL BOTH	0.95	0.1256	0.1393	0.1210
5-0 WITH DISCOUNT OF 250 BP (Pre-Default Yield = 0.1479)				
	0.95	0.1350	0.1429	0.1448
	0.8	0.1372	0.1433	0.1472
LEVEL V	0.95	0.1304	0.1426	0.0937
LEVEL Y	0.95	0.1288	0.1383	0.1437
LEVEL BOTH	0.95	0.1211	0.1383	0.0525

Exhibit XIII (Continued)

Default Simulations:
Net (Post-Default) Yields
(Zero-Default Yield to Maturity Less Yield Differential)

Loan Type	Loan-to-Value Ratio	Net (Post-Default) Yield: Campbell & Dietrich	Peters	Vandell
5-0 GPARM WITH DISCOUNT OF 50 BP (Pre-Default Yield = 0.1542)				
	0.9	0.1414	0.1501	0.1504
	0.8	0.1430	0.1504	0.1529
LEVEL V	0.9	0.1359	0.14397	A
LEVEL Y	0.9	0.1346	0.1456	0.1486
LEVEL BOTH	0.9	0.1253	0.1455	A
1-YEAR ARM PAYCAP WITH DISCOUNT OF 250 BP (Pre-Default Yield = 0.1544)				
	0.95	0.1389	0.1484	0.1498
	0.8	0.1417	0.1488	0.1533
LEVEL V	0.95	0.1319	0.1480	A
LEVEL Y	0.95	0.1286	0.1429	0.1475
LEVEL BOTH	0.95	0.1150	0.1429	A
3-YEAR ARM PAYCAP WITH DISCOUNT OF 275 BP (Pre-Default Yield = 0.1622)				
	0.95	0.1478	0.1569	0.1584
	0.8	0.1503	0.1574	0.1613
LEVEL V	0.95	0.1411	0.1565	A
LEVEL Y	0.95	0.1382	0.1518	0.1564
LEVEL BOTH	0.95	0.1254	0.1517	A
1-YEAR GPARM PAYCAP WITH DISCOUNT OF 50 BP (Pre-Default Yield = 0.1590)				
	0.95	0.1431	0.1539	0.1523
	0.8	0.1460	0.1543	0.1577
LEVEL V	0.95	0.1363	0.1535	A
LEVEL Y	0.95	0.1336	0.1491	0.1496
LEVEL BOTH	0.95	0.1215	0.1490	A
5-ARM PAYCAP WITH DISCOUNT OF 300 BP (Pre-Default Yield = 0.1578)				
	0.95	0.1464	0.1534	0.1555
	0.8	0.1482	0.1537	0.1572
LEVEL V	0.95	0.1414	0.1530	A
LEVEL Y	0.95	0.1397	0.1484	0.1544
LEVEL BOTH	0.95	0.1303	0.1484	A

A - ANOMOLOUS RESULT: HIGH L/V UNDER VANDELL MODEL

Exhibit XIV

Default Simulations:
Net (Post-Default) Yields Relative to Net Yield under FRM

Loan Type	Loan-to-Value Ratio	Relative Net (Post-Default) Yield: Campbell & Dietrich	Peters	Vandell
FRM				
	0.95	1.000	1.000	1.000
	0.9	1.000	1.000	1.000
	0.8	1.000	1.000	1.000
LEVEL V	0.95	1.000	1.000	1.000
LEVEL Y	0.95	1.000	1.000	1.000
LEVEL BOTH	0.95	1.000	1.000	1.000
FRM WITH BUYDOWN				
	0.95	0.925	0.923	0.932
	0.9	0.926	0.923	0.933
	0.8	0.927	0.923	0.933
5-1 WITH DISCOUNT OF 125 BP				
	0.95	1.103	0.105	1.120
	0.8	1.106	0.106	1.121
LEVEL V	0.95	1.095	1.106	1.084
LEVEL Y	0.95	1.086	1.100	1.119
LEVEL BOTH	0.95	1.070	1.101	1.049
5-2 WITH DISCOUNT OF 250 BP				
	0.95	1.109	1.115	1.136
	0.8	1.115	1.115	1.140
LEVEL V	0.95	1.097	1.116	1.080
LEVEL Y	0.95	1.081	1.107	1.134
LEVEL BOTH	0.95	1.059	1.108	1.032
5-0 WITH DISCOUNT OF 250 BP				
	0.95	1.098	1.110	1.126
	0.8	1.106	1.111	1.135
LEVEL V	0.95	1.078	1.111	0.770
LEVEL Y	0.95	1.062	1.099	1.120
LEVEL BOTH	0.95	1.021	1.100	0.448

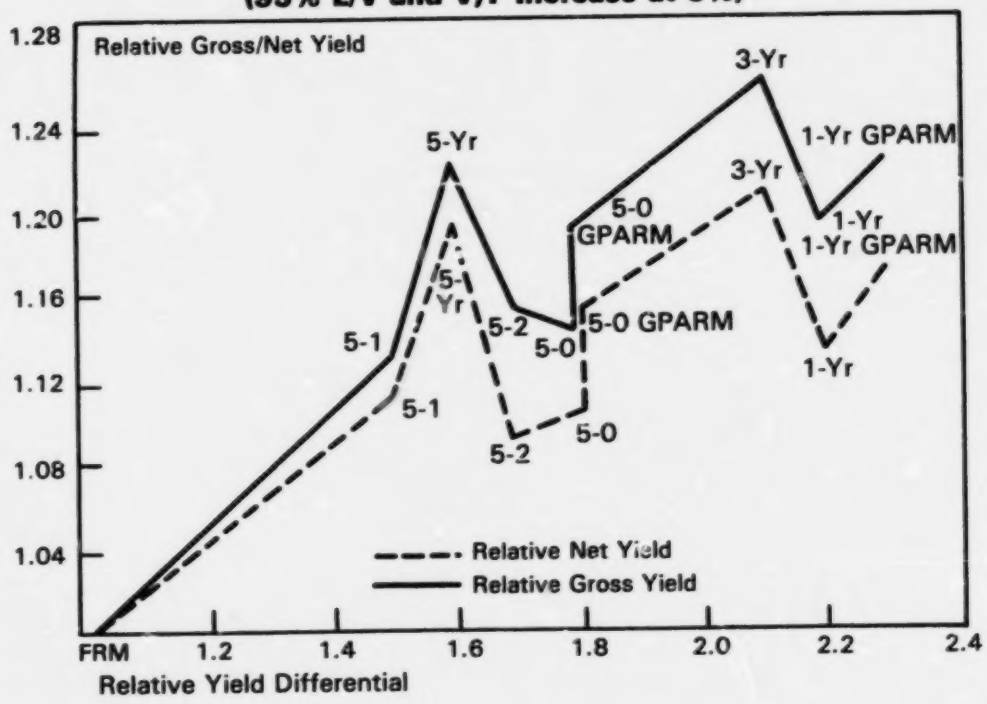
Exhibit XIV (Continued)

Default Simulations:
Net (Post-Default) Yields Relative to Net Yield under FRM

Loan Type	Loan-to-Value Ratio	Relative Net (Post-Default) Yield: Campbell & Dietrich	Peters	Vandell
5-0 GPARM WITH DISCOUNT OF 50 BP				
	0.9	1.150	1.166	1.169
	0.8	1.153	1.166	1.179
LEVEL V	0.9	1.124	1.166	A
LEVEL Y	0.9	1.110	1.157	1.159
LEVEL BOTH	0.9	1.057	1.157	A
1-YEAR ARM PAYCAP WITH DISCOUNT OF 250 BP				
	0.95	1.130	1.153	1.165
	0.8	1.143	1.154	1.182
LEVEL V	0.95	1.091	1.153	A
LEVEL Y	0.95	1.060	1.136	1.150
LEVEL BOTH	0.95	0.969	1.137	A
3-YEAR ARM PAYCAP WITH DISCOUNT OF 275 BP				
	0.95	1.202	1.219	1.232
	0.8	1.213	1.220	1.244
LEVEL V	0.95	1.167	1.219	A
LEVEL Y	0.95	1.139	1.207	1.219
LEVEL BOTH	0.95	1.057	1.206	A
1-YEAR GPARM PAYCAP WITH DISCOUNT OF 50 BP				
	0.95	1.164	1.195	1.185
	0.8	1.178	1.196	1.216
LEVEL V	0.95	1.127	1.195	A
LEVEL Y	0.95	1.101	1.185	1.166
LEVEL BOTH	0.95	1.024	1.185	A
5-YEAR ARM PAYCAP WITH DISCOUNT OF 300 BP				
	0.95	1.191	1.191	1.209
	0.8	1.196	1.192	1.212
LEVEL V	0.95	1.169	1.191	A
LEVEL Y	0.95	1.152	1.180	1.204
LEVEL BOTH	0.95	1.099	1.180	A

A - ANOMOLOUS RESULT: HIGH L/V VANDELL MODEL

Exhibit XV
Default Simulations:
Relative Gross and Net Yields as a Function of Relative Net Yield Differentials by Instrument Type, Campbell and Dietrich Model (95% L/V and V,Y Increase at 5%)



Turning to net yields for the 95 percent base case, we observe that these too tend to be uniformly higher than under the FRM. Thus for all the ARM's the expected yield is increased relative to the FRM, partially in compensaton for the increased default risk borne. Again, within this group, the payment-capped instruments tend to be the highest--in the 13.9 to 15.7 percent range, while the interest-rate-capped instruments tend to be lower, in the 13.5 to 15.0 percent range. These relationships are also plotted in Exhibit XV for the 95-percent base case under the Campbell and Dietrich model.

This same pattern of higher expected net yields holds for the lower loan-to-value ratio case. However, for several of the cases which assume lower income or property value trends there is some indication--at least under the Campbell and Dietrich and Vandell models--that expected net yields could be compromised. This is particularly true of the payment-capped instruments, but is also predicted to a lesser extent under the 5-0 and 5-2

interest-rate capped instruments. The case in which both incomes and values remain level is the most marginal, as expected. Net yield for the 1-year payment-capped ARM under the Campbell and Dietrich model is predicted to be only 97 percent that for the FRM. Even so, however, it must be remembered that our measures of net yield overstate the losses due to default since they assume zero prepayment and 100 percent loss upon default. Thus, we must temper any suggestion of loss exposure accordingly.

Conclusions and Policy Implications

FNMA's acquisitions of ARM's have increased considerably since they were first permitted in 1981, to the point where they currently make up over 22 percent of its conventional loan portfolio. This proportion is expected to increase further in the future and is expected to be made up increasingly of interest-rate-capped, as opposed to payment-capped instruments. The question of whether this acquisition is responsible for the recent increase in default losses experienced by FNMA has been answered predominantly in the negative. While FNMA's rate of foreclosures has increased almost tenfold, the loss per foreclosure has increased almost fifteenfold since 1981. Both the higher loss experience and the higher rate of foreclosure have been precipitated by lower rates of property value appreciation than were anticipated in the early 1980's and the unrecognized past effects of deep buydowns on sales prices. These buydowns were very common during the high interest rate period of 1981-82 among both FRM's and ARM's, so there is no reason to believe that ARM's are solely culpable in this regard. Furthermore, since most ARM's originated during this period were longer-term instruments, they have not yet reached their adjustment period, and therefore could not be responsible for precipitating defaults through "payment shock." Finally, even those which have adjusted primarily to lower rates, which implies negative amortization has been minimal (existing only for the relatively few GPARM's that were purchased).

A second major question addressed in this study is whether the potential exists for higher credit risk in the future as the result of these ARM acquisitions. Here we found definite indications that all of the ARM designs under an adverse steeply-rising interest rate environment would result in increased default as compared to the fixed-rate instrument. Certain of the payment-capped instruments were particularly vulnerable in this regard, predicted to result in 200 to 400 percent increases in default rates in some cases (and higher under more adverse economic conditions). The interest-rate-capped instruments which currently dominate purchases were less culpable, but still were predicted to increase default over 200 percent in a few cases (averaging about 100-150 percent overall). Shorter-term

instruments, those with the graduated-payment option, and those with the maximum permitted first-year discounts were the worst performing from a default standpoint. The relative default performance of the various ARM designs seemed to be relatively independent of the loan-to-value ratio on the loan and the particular economic environment assumed. This increased default risk suggests the advisability of FNMA's significantly increasing its Allowance for Loan Loss account above current levels.

A final question of concern, beyond the impact of ARM purchases on default rates, is to what extent FNMA is successfully trading off increased default risk for reduced interest rate risk to achieve higher profitability. We addressed this question in a simple comparison of default probabilities with expected net yields after default. Our results suggest that the increased yield flexibility of the ARM designs in most circumstances resulted in increased yields which more than offset the losses caused by increased default risk. Thus, expected post-default yields were higher under the various ARM designs than under the FRM and tended to be highest under the payment-capped instruments, compensating the lender for assuming the higher default risk under these instruments. Under more marginal economic conditions, however, this net yield premium was considerably smaller and virtually disappeared under the shorter term payment-capped instruments.

These results must be qualified by several caveats: we tended to overstate yield losses due to default by assuming zero prepayment and no recovery of the outstanding loan balance upon default. Furthermore, we did not price the ARM's through an options pricing framework nor take into account institutional risk adversity, variance about the expected returns, or covariance among the various income, interest rate, or property value trends. Nonetheless certain policy implications may be drawn:

- First, it is clear that the likelihood of default risk is very sensitive to the structure of the various features built into each ARM design. Thus it is important that the negotiated ARM loan window be restricted and monitored very carefully to ensure appropriate risk control.

- Payment-capped instruments and other instruments which will potentially bump up against the 125-percent loan-balance constraint should be redesigned to ensure against the necessity of a sudden substantial increase in payment levels, possibly through an additional interest rate cap.

- The advisability of a uniform 125-percent loan-balance ceiling should be reconsidered, especially for areas or economic environments in which property values are expected to appreciate less rapidly.

- Consideration should be given toward more conservative income ratios for underwriting purposes in the case of existing buydowns or first-year discounts. All such buydowns or discounts should be clearly indicated to FNMA prior to purchase.

- All ARM's, but in particular payment-capped instruments, especially those with the graduated-payment and buydown/discount features, should be monitored very carefully to anticipate adverse default trends. This information should be made public to allow proper responses in the capital markets.

- It may be desirable for FNMA to attempt diversification of its ARM portfolio along geographic lines in order to ameliorate the consequences of possible economic downturns. This is more desirable now than in a FRM world, since default risk under ARM's is so much more sensitive to house price fluctuations due to the negative amortization feature. Such diversification may, however, be constrained by existing legislation such as the Community Reinvestment Act.

- Finally, since pricing of each instrument is so essential to determining whether default risk is being properly compensated (an increased spread of 1 percent could have rendered many of the ARM's unprofitable under our interest rate scenario), the setting of margins and yields should be undertaken very deliberately and only after explicit consideration of future economic conditions which could potentially adversely affect default levels as well as consideration of current monetary conditions and borrower demand.

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Comment On Kerry D. Vandell, "An Analysis Of The Credit Risk Inherent In FNMA's Recent Portfolio Acquisitions Of Adjustable Rate Mortgages"

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Professor Vandell analyzes the default risk of ARMs by adapting the FRM default models previously published by Vandell [1978], Peters, et al [1984], and Campbell and Dietrich [1983]. By respecifying the models to include only non-instrument specific relationships, it is posited that some indirect measure of default risk can be achieved.

A Rational Default Model

Separate from the problems of instrument specificity and periodicity, the fundamental question seems to be whether the purely rational model of default for an ARM would be any different from that of a FRM. Rationally, default should occur if:

$$V_m > V_h + MC,$$

where V_m is the value of the mortgage, V_h is the value of the house and MC is moving costs. I would claim the rational motive is still operative. Therefore, any notable differences in credit risk between ARMs and FRMs must result from either instrument-specific variables (as they affect V_m) or borrower-specific variables (as they affect MC). Clearly the property value is independent of either the financing arrangement or borrower characteristics.

The second question is whether the empirical models, particularly the three addressed in the Vandell study, appropriately measure the changes in the theoretical variables or whether they also interject the actions of certain ad hoc variable that don't seem to fit into a rational framework. I feel comfortable that the three models employed do fit into the scheme of rationality.

Let's examine the variables utilized by the three models. The L/V ratio, which is the cornerstone of all default models, is also the essence of the theoretical model. However, as Vandell notes, it is important that it not be the initial L/V ratio but rather a contemporaneous variable. Vandell claims all three models utilize a contemporaneous L/V ratio. I disagree with this assertion because only one of the models adjusts for both the house value component and the loan value component. The other two adjust for only the house value.

This is a critical issue because households make default decisions based on the market value of their debt, not on the basis of the principal outstanding. The cost of default, in contrast, is a function of the outstanding principal, because insurance claims and legal claims are calculated as a function of the outstanding principal. But it is the market value of the debt that determines the timing of default.

The mortgage market is unique with respect to debt valuation; the mortgages have asymmetric distributions. For FRMs as interest rates rise the value of the mortgage falls, but as interest rates fall the value of the mortgage remains relatively fixed at face value because homeowners exercise their call options and refinance the mortgages.

For ARMs, as interest rates rise the mortgage value remains relatively fixed because the coupon rate is renegotiated to current levels. Naturally this static condition depends on the length of adjustment periods and magnitude of interest rate caps. Likewise, as interest rates fall the value of the mortgage is also fixed due to the same right of renegotiation or refinancing. This asymmetry of FRM values vis-a-vis ARM values is the major problem in adapting a FRM default model to an ARM model. FRM values are bounded at the top but not the bottom, while ARM values are bounded at both the top and bottom.

For FRMs, rising interest rates create a form of "equity accumulation" for homeowners who choose to implicitly assume their mortgages. As a result, the FRM borrower will delay default, whereas the ARM borrower will not.

Only the Campbell and Dietrich (C-D) model appears to account for changes in the mortgage value. They accomplish this through a variable that measures the market value rate of interest relative to the coupon rate. Its coefficient is negative, so indeed as the market value rises, the mortgage value falls and people are less likely to default.

The payment-to-income ratio is also common to all default models. For FRMs, it measures payment burden, and for ARMs it measures payment stock. It captures the probability of a borrower becoming delinquent. Although delinquency is distinctly different from default, it is important to realize that delinquency is simply imposed borrowing. It is a form of negative amortization that occurs at the borrower's option. It effectively increases the market value of the mortgage by increasing the principal outstanding, and therefore increases the likelihood of default. The Peters model introduces the possible existence of a second mortgage which, like delinquency, acts to increase mortgage value outstanding and thus increase default probabilities.

In summary, negative equity clearly matters. But as Foster and Van Order [1983] noted, how much is not clear. In fact, at the margin, a person's decision to default may simply come down to the magnitude of his moving costs, which brings us to borrower characteristics.

The borrower characteristic variables are common to most models (although they are absent in the Vandell model). These are sometimes criticized as seemingly ad hoc. However, upon further reflection, I believe we can make these fit into the rational scheme of events. It seems appropriate to think of the borrower variables as proxies for moving costs. Examine the age variable for example: the young are also the restless and for them moving is cheap, particularly psychic costs. Many are moving for job-related reasons and if one must move anyway, then moving costs become irrelevant. Default may indeed be a cheaper proposition than trying to sell a devalued piece of property.

Other variables used to capture the propensity to move are migration variables and macroeconomic variables. The C-D model even includes a dummy variable to measure whether or not the house is new. Its sign is (+) and proxies for the age of the borrower.

The Peters model is unique in its inclusion of a regional variable. It seems to capture two elements. The first, and most obvious, is the regional differences in house price inflation. The second is the differences among states in their so-called antideficiency legislation. As I understand the foreclosure process, some states will allow relatively quick foreclosure proceedings, while in other states they are protective of tenant rights and may allow the borrower to remain in the house (rent free) for up to two years. During this period, the borrower's mortgage has negatively amortized from accrued interest charges. In addition, there has probably been inadequate maintenance of the property resulting in its devaluation. For modeling purposes it would be interesting to form regional cohorts of mortgages and then apply dummy variables on a state-by-state basis rather than having regional dummy variables.

Results

In general, the C-D model predicts higher absolute default rates followed in order by the Vandell model and the Peters model. Because the Vandell model is based on FHA mortgages which have assumption rights, one should expect it to predict lower default rates. However, the "due-on-sale" requirements of conventional mortgages were probably not significant in the C-D and Peters models until the late 1970's and 1980's because prior to that time there was little enforcement.

As noted in the paper, the net yield calculations are biased upward because of an assumed 30-year life and total loss assumption from default. It would be more appropriate to include some average weighted life assumption and at least PMI reimbursement in the event of default.

With respect to the 2-1/2% rate rise scenario, it isn't clear how the 5 year ARM rate adjustment was treated vis-a-vis the adjustments on the shorter term ARMs. It seems surprising that the 5 year ARM ranks 5th and 6th rather than 3rd, right after the FRM, in terms of default probabilities.

Adverse selection on ARMs is a valid point. As noted by the Freddie Mac ARM survey under Mike Lea's direction [1984], mobile families do choose ARMs in greater proportions than the less transient families. Their moving costs are lower and they are more likely to default.

It is disturbing that the C-D model predicts the highest default rates. Because of the variable that measures market rates relative to the contract rate (MR/CR) the results are actually biased downward. As discussed earlier, ARM values are bounded at the top and bottom and are therefore not devalued with rising rates. As a result, the MR/CR variable should be eliminated from the equation because ARM values are relatively insensitive to rate changes. Unfortunately, its elimination will result in even greater default rates under the C-D model.

Regarding the Peters model, it probably has lower default predictions because of the sample period 1973-1980, when housing values were experiencing high inflation rates. Equity accumulation dominated all other variables, resulting in very few defaults.

As a final note, maximum default rates don't tell the whole story. Timing and duration are also important; e.g., one year of high default rates might actually be less costly than a prolonged period of moderately high default rates.

Policy Issues

FNMA should attempt to adequately diversify its portfolio due to geographic differences in both house price appreciation rates and geographic differences in antideficiency legislation.

FNMA should insure independence of appraisal reports. The C-D "adverse selection" default phenomenon on loans with less than 85 LTV ratios may actually represent impropriety in the appraisal reports. The value of below market seller financing should be isolated and not capitalized in the value of the house.

FNMA might address the issue of brokered mortgages where the originator retains neither the loan or its servicing. Monitoring expertise appears to be lost in the brokering process. This is particularly true with the proliferation of ARM instruments. Mortgage bankers have moved into communities and dominated the lending market with highly competitive rates on a

broker loan arrangement. However, linkage with the local community may be lost when the loans are sold. An appropriate protective step might be the requirement of strict "with recourse" clauses on brokered loan arrangements. Furthermore, if ARMs do attract the mobile class of borrowers, then perhaps closer monitoring of the loan and property would be appropriate.

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An Interest Rate Risk Analysis Of The Federal National Mortgage Association

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INTRODUCTION

This study has been commissioned by the General Accounting Office. The purpose of the study is the performance of an analysis of portfolio risk, specifically the interest rate risk, of the Federal National Mortgage Association (FNMA). This analysis initially involves the development of a detailed balance sheet of FNMA. FNMA's balance sheet is public knowledge in its aggregate, but public documentation does not detail nor provide specifics with respect to asset yields and maturities. Nor does the public documentation provide similar complete information for the liability side of the balance sheet. In order to perform a comprehensive gap analysis of the balance sheet it is necessary to know the coupons and maturity structure of the assets within repricing periods, and the cost and maturity structure of the liabilities within their respective repricing periods.

This study will attempt to construct a 1983 FNMA balance sheet with estimated coupon and maturities on all earning assets within defined repricing periods, and similar estimates for liabilities. The study will base the estimates on historical data of FNMA activities from 1965 to 1983. Once the balance sheet has been constructed, the study will turn to traditional gap analysis to evaluate the degree of interest rate risk faced by FNMA in 1983. The initial gap model will operate on a standard maturity measuring technique. Further analysis will be conducted using a duration technique.

FNMA has a maturity mismatch between its assets and liabilities. The Corporation had losses in 1981 and 1982 due to the excess cost of outstanding debt over the yield on its mortgage portfolio. The negative spread was serious enough in these years to exceed other income and generate a net loss to the Corporation. In 1983, the Corporation also had a negative spread but net income was positive. It is highly probable that FNMA will also experience a loss both in the spread and net income in 1984.[1] FNMA's balance sheet mismatch, coupled with volatile and rising interest rates in the 1980s has caused serious earning problems. Interest rate risk is not unique to FNMA, the thrift industry has faced similar problems. But given the size of FNMA's balance sheet and the degree of leverage, significant increases in interest rates could result in massive losses for the Corporation. The purpose of this study is to measure the level of interest rate risk that is currently faced by the Corporation.

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1 _____. Guide to Debt Securities. Washington, D.C.: Federal National Mortgage Association, (November, 1984), p. 3.

FEDERAL NATIONAL MORTGAGE ASSOCIATION

FNMA is a federally chartered and privately owned corporation. FNMA is the largest investor in home mortgages in the country. The Corporation held a net portfolio of $75.7 billion of mortgage loans as of the end of 1983. FNMA was originally created in 1938 as a United States government agency, its purpose was to provide supplemental liquidity to the mortgage market. FNMA was transformed into a stockholder owned, and privately managed corporation through legislation passed in 1968. The 1968 legislation created two separate entities to divide the mortgage market responsibilities that had formally been the exclusive province of FNMA. Congress established the Government National Mortgage Association [GNMA]. GNMA is a government corporation, without capital stock or a board of directors. It is wholly a part of HUD. The 1968 HUD Act assigned two functions to GNMA previously the responsibility of FNMA. The special assistance function, and the management and liquidation function became the responsibility of GNMA. Since 1968, FNMA's primary function is secondary mortgage market operations. Secondary mortgage market operations basically involve mortgage purchases [and sales] by the Corporation to provide supplementary assistance to the housing market by increasing the liquidity of mortgage lenders. The function also implies the sale of mortgages from FNMA's portfolio when liquidity is abundant.

In its secondary market activity FNMA was originally limited to purchasing FHA and VA mortgages. Since 1972, FNMA has been permitted to purchase some types of conventional mortgages. In the 1980s FNMA has extended its secondary market activity. In 1981, the Corporation began issuing guaranteed mortgage pass through certificates evidencing beneficial interest in pools of conventional loans. The Corporation began issuing similar certificates representing beneficial interests in FHA and VA mortgage pools in 1982.

FNMA MORTGAGE PORTFOLIO

This section of the study will examine the Corporation's mortgage portfolio. Of particular interest is the purchase and sale activity. Table 1 presents the mortgage portfolio for the years 1979 to 1983. Also included in the table are the purchase activities, prepayment flows, and sales activities. The purpose of presenting this material is to examine the magnitude, and flux within the portfolio over the years since 1979, a period of significant interest rate volatility.

Table 1

Mortgage Portfolio and Activity: 1979-1983
[millions of dollars]

	1979	1980	1981	1982	1983
UNPAID BALANCES					
Home: FHA/VA	29,382	33,417	34,551	33,742	31,000
Conventional					
Fixed	16,106	18,358	21,155	27,790	32,533
Arms			107	3,332	7,126
Seconds			175	1,636	2,385
Project: FHA/VA	5,609	5,552	5,426	5,283	5,148
Conventional					
Fixed				31	63
Total unpaid balance	51,097	57,327	61,412	71,814	78,256
Avg. yield net serving	8.75%	9.24%	9.85%	10.73%	10.70%
PURCHASES					
Home: FHA/VA	5,388	5,273	2,284	901	186
Conventional					
Fixed	5,410	2,802	3,544	9,443	11,702
Arms			107	3,210	4,246
Seconds			176	1,552	1,408
Project: FHA/VA	9	27	2	10	8
Conven. Fixed					6
Total Mort. Purchases	10,807	8,101	6,113	15,119	17,557
Avg. net yield	10.11%	12.27%	15.38%	15.00%	12.65%
REPAYMENT					
Home: FHA/VA	2,061	1,343	1,252	1,264	2,046
Conventional					
Fixed	828	549	741	910	3,474
Arms				29	452
Seconds				92	658
Project: FHA/VA	115	84	127	121	111
Conven. Fixed					7
Total Repayments	3,004	1,977	2,120	2,415	6,747
SALES					
Home: FHA/VA					
Conven. Fixed	1	1	9	518	907
Project: FHA/VA	21		1	1,897	3,560
Total Sales	22	1	10	2,415	4,468

Source: Guide to Debt Securities. Federal National Mortgage Association. [November 20, 1984], p. 2.

Table 1 shows that the total portfolio has increased by slightly more than 50% between 1979 and 1983. FNMA's recent purchase activity has been in the area of conventional mortgages rather than FHA/VA, which has resulted in the total conventional portfolio of home mortgages exceeding the government guaranteed mortgages in 1983. FNMA's sale activity had been insignificant up until 1982 and 1983. The large increase in sales in these years probably reflects moderating interest rates, with corresponding higher prices on older mortgages, and an attempt on the part of the Corporation to restructure the balance sheet. An important consideration in the interest rate risk analysis is FNMA's purchase and sale activity within the mortgage portfolio, and the structure of its liabilities. These topics will be discussed in detail below.

MORTGAGE PORTFOLIO PURCHASE ACTIVITIES

The principal activity of FNMA involves the purchasing of mortgages that are primarily mortgages on residential property that have met FNMA's eligibility requirements. The typical method of purchase is through the use of commitments issued by the Corporation. Before 1968, FNMA purchased all mortgages over the counter, but this system lacked efficiency because it failed to give the lenders sufficient assurance that funds would be available when they were needed. In 1968, FNMA instituted an auction market for commitments. FNMA solicited bids for purchase commitments by specifying a dollar amount of loans, and the yields to FNMA. For the commitment, which was effectively a put option, the seller paid FNMA 1/2 of 1%. For this fee, the seller could, within the four month commitment period, sell the mortgage package to FNMA at the agreed upon yield, and price. This type of arrangement is workable in periods of stable interest rates, but by the late 1970s and early 1980s capital market interest rates had become highly volatile. The effective put option that FNMA created with its commitment system exposed the firm to a great deal of interest rate risk.[2] If interest rates soared, driving prices down the seller was sure to deliver the package of mortgages to FNMA at the higher agreed upon commitment price. If rates fell and prices increased the seller would attempt to hold the mortgages for the higher open market prices.

In 1981, the Corporation instituted several new mortgage purchase programs. This new initiative was an attempt by FNMA to place less reliance on forward purchase commitments, and thus assume less interest rate risk. The Corporation's new commitment program involved the posting of the prices it would pay for

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[2]Douglas Hearth. Federal Intervention in Mortgage Markets: An Analysis. Ann Arbor, Michigan: UMI Research Press, 1983, p. 21.

mortgages delivered at any time during a one or two month period. Unlike the former forward purchase commitments, the new agreements made delivery on the part of the seller mandatory. The lenders paid a fee for the commitment in most cases, the fee had traditionally been 1/2 of 1%, but it was increased along a range from 1/2 of 1% to 2% depending on market conditions, the type of mortgage loan, and the length and characteristics of the commitments. Under the new standby commitment program, FNMA contracts to purchase a certain amount of mortgages, but the yield is not established at the time the standby commitment is issued. To deliver the mortgages, the seller must convert the standby commitment to a mandatory delivery commitment. The seller will usually pay an additional fee at conversion, and at the point of conversion the yield on the mortgage is set.

The 1981 decision to move to mandatory commitments was necessary and sensible in a world of interest rate volatility. With a mandatory delivery system FNMA is effectively eliminating the put option held by the seller, and forcing the seller into a contract that can experience interest rate risk. From FNMA's standpoint, as long as interest rate movement is a random and unbiased event, the mandatory commitment should effectively reduce the inherent interest rate risk associated with the voluntary system. The presence of higher fees, if they result in higher fee revenue, should help to insulate more of FNMA's income from interest rate movements.

Since 1981, FNMA has instituted other policies that should have the effect of making its portfolio more responsive to fluctuations in prevailing money and capital market rates, and better match its borrowing costs. One such program is FNMA's purchasing of adjustable rate mortgages. Up until 1980 the Corporation held no adjustable rate mortgages, they purchased a small amount in 1981, but in 1982 the Corporation purchased over $3 billion of ARMs, and over $4 billion in 1983. At the end of 1983 FNMA held $7.126 billion of ARMs. With a total mortgage portfolio of $78 billion in 1983 the $7 billion in adjustable rate loans will not have a major impact on FNMA's interest margin in the near future. But if FNMA continues to purchase ARMs in the quantities purchased in 1982 and 1983, and if the repricing dates are short enough this program will eventually have a significant effect on FNMA's interest rate risk problem. The continued success obviously depends on the origination supply of ARMs and the yields on the adjustable rate loans.

Another new program that was initiated in late 1981 was the purchasing of second mortgage loans. Traditionally FNMA had been a purchaser of first mortgage liens, but the Corporation has recently been more aggressive in the purchasing of second mortgage liens, which although riskier, the second mortgages

have the advantage of providing higher yields, and having shorter maturities. FNMA purchased a minimal amount of second mortgages in 1981, but in 1982 purchases were $1.55 billion, and in 1983 $1.4 billion. At the end of 1983 FNMA's portfolio shows $2.4 billion in second mortgages. The use of adjustable rate mortgages, and second mortgages may enhance yield in the short run. In the intermediate and long term these programs could have a significant impact on reducing the overall balance sheet mismatch.

The Corporation has taken steps within their mortgage purchasing program to reduce their balance sheet maturity mismatch, but as of the end of 1983 the majority of FNMA mortgage portfolio consisted of fixed rate mortgage loans. The majority of these loans carry an original maturity of 30 years.

MORTGAGE SALES ACTIVITY

FNMA is authorized to sell as well as purchase mortgages. FNMA's function is that of a secondary market participant with the responsibility to manage liquidity in the market. FNMA is therefore not limited to simply purchasing mortgages to provide additional liquidity during periods of declining credit availability. The Corporation was also given the power to reduce

Table 2

FNMA Activity Since 1970
[millions of dollars]

Year	Purchases	Sales	Year End Portfolio	Net Savings Inflow*
1970	5,078	0	15,502	11,018
1971	3,574	336	17,791	27,974
1972	3,699	211	19,791	32,663
1973	6,127	71	24,175	20,237
1974	6,953	4	29,578	16,068
1975	4,263	2	31,824	42,806
1976	3,606	86	32,904	50,858
1977	4,780	67	34,370	51,016
1978	12,303	5	43,311	44,864
1979	10,805	22	51,097	39,304
1980	8,100	0	57,327	41,417
1981	6,112	10	61,412	13,425
1982	15,119	2,415	71,814	--
1983	17,557	4,468	78,256	--

*Inflows to S & L's.

Source: Federal Reserve Bulletin: various issues.

mortgage market liquidity, through the sale of mortgages from its portfolio whenever there is excessive liquidity in the market.

Table 2 summarizes FNMA's purchase and sale activity from 1970 to 1983. The table also presents the total portfolio, and the inflow of savings into savings and loan associations. FNMA's total portfolio has increased every year since 1970. The purchase activity reflects FNMA's attempt to meet its charter responsibility of adjusting liquidity; although there is little evidence that FNMA has behaved in a countercyclical fashion. FNMA purchased large dollar amounts of mortgages in 1970, and 1974, years of relatively low savings inflow. But in 1977, a year of record inflow of savings to the S & Ls, the Corporation purchased a relatively large package of mortgages. In 1978, and 1979, years of relatively large savings inflow, FNMA had record high mortgage purchase activity. Correspondingly, the sales activity has been relatively low, even during years of large savings inflow. The only years where mortgage sale activity is relatively large were 1982 and 1983. This relationship between purchase and sale activity, and savings inflow would appear to raise some questions as to FNMA's countercyclical behavior given its charter. This study is concerned with interest rate risk, and table 2 gives some insights into the reasons for FNMA's balance sheet mismatch. With respect to the balance sheet's maturity mismatch and the resulting interest rate risk a couple of conclusions can be drawn from table 2.

1. FNMA's balance sheet would have a better asset-liability maturity match in 1984 if the Corporation had conducted significant sale activities in the 1970s. Also, the mortgage portfolio would have a higher return on assets, regardless of rate movements, if significant sale activity would have occurred over the last decade. Those coupons that in the 1984 environment are relatively low could have been sold in the 1970s resulting in higher asset yield at the present time.

2. FNMA's behavior in the 1970s with respect to purchase and sale activity is partially responsible for its present balance sheet mismatch, and probably can be attributed to two factors.

a) The intense political pressure brought on all housing market participants to continually add liquidity to the market to maintain lower borrowing costs to home buyers, and to facilitate a strong housing market.

b) A review of interest rate movement over the last fifteen years provides some insight into fixed income portfolio management. The level of rates during this period continually rose to new historically

high percentages. Using hindsight one can readily suggest opportunities within the fifteen year period for portfolio sales at moderate discounts, or moderate premiums. Using this hindsight it is rather easy to restructure a fixed income portfolio to avoid the present mismatch situation. Unfortunately, actual portfolio management operates in the current period, and must deal with the uncertainties of forecasting. The new historical high levels of the mid 1970s were viewed as exactly that, new historical highs that would eventually decline to a more normal level of interest rates. As a portfolio manager, with only past history as a guide it appeared rational to wait for a decline in rates before selling the current portfolio at relatively large discounts. FNMA's balance sheet mismatch is probably not unlike the mismatch on the balance sheet of many thrift institutions. Both reflect a management approach that was more inclined to purchase fixed income assets rather than to sell. The moderation of rates in late 1982, and 1983 coupled with FNMA's relatively large sale activity would seem to reinforce the above conclusion. That is, by 1982 managers had realized the potentiality of interest rate changes, and 1982-1983 rates offered profitable sales, and a chance for restructuring.[3]

There are two primary motivations for sales of mortgages from FNMA's portfolio. The first is to maintain a steady flow of new issues of FNMA's MBSs in the coupon rates being used by mortgage originators. This steady flow improves the liquidity of the security and is especially important when market yields change substantially. In this activity, the Corporation pools mortgages from its own portfolio or purchases mortgages from lenders in exchange for cash, assembles the mortgage instruments in a pool, and sells the related certificates pursuant to public offerings and private placements. The mortgage pass through security is modeled after the GNMA mortgage backed security which has become a highly successful secondary market instrument. The MBS is currently playing a large role in FNMA's operation. The advantage of the MBSs is that the Corporation receives fees for its origination, servicing, and guaranty of certificates; a portion of which is paid by FNMA to the institutions that directly service pooled loans on behalf of FNMA.

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[3] In his argument for the speculative demand for money, Keynes discusses the concept of historical norms. That is, investors behavior toward bond purchases and sales reflects their view as to a normal rate of interest, and therefore normal bond prices.

Another advantage of MBS is that it allows FNMA to further its statutory purpose of increasing the liquidity of residential mortgages without requiring that the Corporation take the financing or spread risk on the pooled mortgage loans.

The second motivation for sales activity is the sale of fixed rate loans from FNMA's portfolio. This activity is the key to FNMA's reduction of its aggregate exposure to interest rate movements. It would be in the Corporation's interest to sell the longest maturity assets with the lowest coupons. This particular type of sale would reduce the balance sheet mismatch. The sale of seasoned mortgages is constrained by the accounting treatment of mortgage sales at a loss. Given the realities of today's high interest rates it is almost a certainty that any mid to early 1970s coupon that is sold will be sold at a substantial discount. When FNMA sells a low coupon loan, it must essentially capitalize future losses, and report them in the current accounting period. Therefore, FNMA must be cautious of discount sales because of the impact it will have on earnings. Sales of mortgage loans that do not carry significant discounts are desirable, but they are more difficult to obtain because they involve lower interest rate environments. Sales at a gain have less portfolio shortening effect because they are assumed to have high prepayment rates.

FNMA's sales activity had increased to substantial levels in 1982 and 1983. FNMA was taking advantage of a moderating interest rate environment, and acting to reduce interest rate risk at a reasonable cost.[4]

The above discussion has involved FNMA's mortgage portfolio. The Corporation is the largest mortgage loan holder in the United States. Approximately 97% of FNMA's assets are held in the form of mortgages. Therefore any interest rate risk analysis must involve the mortgage portfolio when addressing the asset maturity structure. As shown above, the portfolio has been acquired primarily through aggressive purchasing activity over the last fifteen years. The next section of this paper will address the liability side of the balance sheet, and specifically the maturity structure of the liabilities.

FNMA'S LIABILITIES

FNMA has historically been one of the largest borrowers in the domestic capital markets. Note that FNMA is privately owned, and its obligations, for the most part, are not guaranteed by the United States government nor any government agency. However, FNMA debt has traditionally been treated as U.S. agency

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[4] Guide to Debt Securities, p. 21.

debt in the marketplace. The general consensus of the investment community has been that although FNMA's debt is not guaranteed, the Corporation's purpose and activity in the mortgage market is of such importance that the government would not allow default on the debt. This attitude on the part of investors has allowed FNMA to have access to funds in the private credit markets at rates that are slightly higher than the yields on U.S. Treasury obligation of comparable maturities.

FNMA has several sources of funds available. Its primary source of funds is its liabilities which include the sale of debentures and discounted notes. FNMA debentures are sold in minimum lots of $10,000, and integral multiples of $5,000 thereof. They have maturities from 3 to 25 years. In 1984 FNMA began issuing debentures exchangeable into adjustable rate preferred stock, and also zero coupon debentures which do not pay interest periodically but have as the only scheduled payment the amount due at maturity. FNMA notes are very similar to commercial paper and Treasury bills. They have maturities of 30 to 360 days, they are presently sold at discount in $50,000 minimum denomination. Proceeds from the sale of debentures and notes have typically represented about 80% of total funds raised by FNMA each year.

The ability to issue debentures with their relatively longer maturity is a particular advantage for the Corporation. The use of the debenture can extend the maturity structure of FNMA's debt and help reduce the overall balance sheet mismatch, and one of the major characteristics that differentiate FNMA from other mortgage market participants, particularly the thrift industry.

Table 3 shows the liability and owner equity position of FNMA on December 31, 1983. FNMA is a highly leveraged corporation. Almost 99% of FNMA's total assets are being supported by liabilities. The majority of FNMA's liabilities are in the form of debentures and notes. In 1983 approximately 36% of the debenture/note debt was in the maturity category of one year or less, and 64% due after one year.[5] FNMA's ability to lengthen liability maturity is a crucial factor in interest rate risk management. Table 4 examines the specific make-up of FNMA's

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[5] Ibid., p.39.

Table 3

FNMA: Liabilities and Stockholder Equity
December 31, 1983
[thousands of dollars]

Liabilities:	
Bonds, notes and debentures, net	
Due within one year	$ 26,859,533
Due after one year	47,734,289
Total	74,593,822
Accrued interest payable	1,904,645
Mortgage escrow deposits	271,440
Deferred federal income taxes	568,200
Other liabilities	303,519
Total Liabilities	$ 77,641,626
Stockholder's Equity:	
Common stock	412,742
Paid-in capital	310,913
Retained earnings	554,151
	1,277,806
less Treasury stock	1,895
Total stockholder equity	$ 1,275,911
Total Liabilities and Stockholder Equity	$ 78,917,537

Source: Guide to Debt Securities. Federal National Mortgage Association. (November 20, 1984). p. 43.

bonds, and notes. Table 5 presents a very detailed description of FNMA debt over the last five years. The final category of that table, Total Debt, is interesting in that it demonstrates the changing maturities of the total debt issued in the last five years. The average maturity of total debt declined from a 39 month average maturity in 1979 to 27 month average maturity in 1982. The cause of the decline was the large borrowing of shorter term maturities in the years 1980, 1981, and 1982. The average maturity of total debt in 1983 increased to 29 months, and should be slightly longer in 1984.[6]

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6 Ibid., p. 26.

Table 4

FNMA - Bonds, Notes and Debentures,
Net on
December 31, 1982 and 1983
[dollars in millions]

	1982	1983
Due within one year:		
Short term notes	$10,833	$11,324
Master notes	715	--
Debentures	15,289	14,434
Mortgage-backed bonds	23	13
Total due within one year	$26,860	$25,781
Due after one year:		
Debentures	45,794	41,825
Mortgage-backed bonds	402	464
Capital debentures	1,510	1,509
Convertible capital debentures	28	35
Total due after one year	$47,734	$43,833
Total	$74,594	$69,614

Source: Guide to Debt Securities. Federal National Mortgage Association. [November 20, 1984], p. 44.

In addition to the two above mentioned instruments, bonds and notes, FNMA also has access to bank lines of credit. It also has the ability to obtain long term funds by issuing FHA mortgage backed bonds which are guaranteed by GNMA, and therefore represent obligations of the United States government. FNMA may also sell additional stock under its charter. Another significant potential source of borrowing is from the United States Treasury. Section 304 [c] of the Federal National Mortgage Association Charter Act authorizes the Secretary of the Treasury, as a public debt transaction, to purchase obligations of the Corporation up to a maximum of $2.25 billion outstanding at any time. The interest rate on these obligations is to be based upon the average rate on outstanding marketable obligations of the United States as of the last day of the month preceding the date of making such purchases.[7] FNMA did not utilize its commercial line of credit, nor did it use its Treasury borrowing authority in 1983.

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[7] Ibid., p. 44.

The above discussion has focused on the balance sheet of FNMA. The next section of this study will involve the concept of interest rate risk and gap analysis, and the relationship and applicability of these concepts to the Federal National Mortgage Association.

Table 5

FNMA Debt: 1979 - 1983
[millions of dollars]

	1979	1980	1981	1982	1983
Short-Term notes, Master, and Inv. notes					
Issued during period					
Amount	$10,567	$17,654	$30,185	$34,196	$20,262
Cost	11.75%	14.29%	16.56%	12.31%	9.47%
Avg. Mat. - days	198	152	98	129	161
Outstanding at end					
Amount	$ 6,593	$ 8,578	$ 9,189	$11,752	$11,841
Cost	12.09%	14.68%	15.47%	10.48%	9.67%
Avg. Mat. - days	108	92	57	141	106
Bonds and Debentures					
Issued during period					
Amount	$10,056	$11,500	$10,221	$20,764	$19,756
Cost	9.71%	12.05%	15.26%	13.62%	10.66%
Avg. Mat. - months	57	48	43	36	53
Outstanding at end					
Amount	$41,831	$46,604	$49,560	$58,279	$63,046
Cost	8.33%	9.32%	10.71%	11.55%	11.38%
Avg. Mat. - months	45	41	36	32	34
Total Debt					
Issued during period					
Amount	$20,623	$29,154	$40,406	$54,960	$40,018
Cost	10.72%	13.37%	16.22%	12.82%	10.07%
Avg. Mat. - months	31	22	13	16	29
Outstanding at end					
Amount	$48,424	$55,182	$58,749	$70,031	$74,887
Cost	8.81%	10.11%	11.42%	11.38%	11.12%
Avg. Mat. - months	39	35	31	27	29

Source: Guide to Debt Securities. Federal National Mortgage Association, [November 20, 1984], p. 26.

INTEREST RATE RISK

Prior to 1970 money and capital market interest rates were relatively stable, and the level of rates was considerably below the current average of rates. The prolonged inflation of the late 1960s and 1970s changed the level of interest rates. Financial institutions and other entities that held financial assets, and earned their revenue from their securities portfolio, encountered both increasing yield on assets, and increasing costs of liabilities. A higher level of interest rates is in itself not a serious problem, given sufficient time for adjustment. But adjustment time is basically a function of the maturity characteristics of the assets and liabilities on the balance sheet. Entities such as money market mutual funds which have asset and liability maturities that are closely matched can quickly adapt to changing rate levels. Commercial banks which have generally had a reasonably good match between asset and liability maturities have been reasonably successful in adapting to higher interest rates. The most serious problems associated with interest rate risk arise in those institutions that have historically lent long, and borrowed short. This balance sheet mismatch problem has been most prevalent in the mortgage related institutions, particularly the thrifts. Although FNMA is not a thrift, it has traditionally been a secondary mortgage market operator that acquired a portfolio of mortgages with maturities that are substantially longer than the maturity of its liabilities.

Interest rate volatility, especially the degree of volatility that the United States' money and capital markets have experienced since 1979, has compounded the problem. The volatility of rates makes it more difficult to restructure balance sheets because of the uncertainty it creates. An indication of the impact of interest rate movements can be shown through FNMA data from 1979 to 1983, a period of extreme volatility.

Table 6

FNMA Interest Margin: 1979 - 1983
[millions of dollars]

Year	Interest Margin
1979	$ 322
1980	21
1981	[463]
1982	[506]
1983	[62]

Source: Guide to Debt Securities. Federal National Mortgage Association. [November 20, 1984] p. 21.

The data in table 6 shows the interest margin between FNMA's total interest income minus total interest costs. The volatility of the movement of net interest earnings is indicative of an entity with a seriously mismatched balance sheet. Another example of the mismatch problem can be shown by examining the yield on the mortgage portfolio versus the cost of debt over the same five year period.

Table 7 demonstrates the potential seriousness of a mismatched balance sheet. Note that the period between 1979 to 1983 was one of generally rising interest rates. FNMA's assets have longer maturities than their liabilities which translates to a negative gap and results in earning problems as rates rise. For example, between 1979 and 1980 the net yield on mortgages purchased increased by 138 basis points but the average cost of debt issued in the period increased 265 basis points. This resulted in an increase in the total yield on the portfolio moving up by 49 basis while the cost of debt increased 130 basis points. 1981 presents an excellent example of the nature of the gap or repricing problem. Mortgage purchases during the year yielded 15.38%, while the cost of newly issued debt was 16.22%. To compound this yearly differential the total yield for 1981 increased 61 basis points over the 1980 yield. But the total cost of outstanding debt increased 131 basis points between 1980 and 1981.

Table 7

FNMA Average Yield on Mortgage and Average Cost of Debt: 1979 - 1983

	1979	1980	1981	1982	1983
Avg. net yield of mortgages purchased in period	10.11%	12.27%	15.38%	15.00%	12.65%
Avg. cost of debt issued in period	10.72%	13.37%	16.22%	12.82%	10.07%
Avg. yield of mortgage portfolio at end of period	8.75%	9.24%	9.85%	10.73%	10.70%
Avg. cost of debt outstanding at end of period	8.81%	10.11%	11.42%	11.38%	11.12%

Source: Guide to Debt Securities. Federal National Mortgage Association. [November 20, 1984] pp. 21, and 26.

The interest margins in table 6 and the average yield and cost data in table 7 demonstrate some of the problems associated with balance sheets that hold, on average, assets with longer maturities than the liabilities. A cursory review of FNMA's balance sheet, and earnings statement suggest the basic dimensions of the mismatch. This study will incorporate the use of a gap model in order to measure, and quantify the degree of interest rate risk that FNMA was exposed to at the end of 1983. The gap model will analyze the difference between the dollar value of rate sensitive assets and rate sensitive liabilities. The model used in this study will incorporate a number of gap periods, starting with a 0 to 1 year maturity interval. In this context, the rate sensitive assets are those that can experience contractual changes in interest rates or can be repriced with respect to the interest yield during the gap period. Variable rate assets that reprice during the gap period are also rate sensitive regardless of their maturity. The periodic return of principal or prepayments that occur during the gapping period are also considered rate sensitive because the flow can be repriced. This last factor, amortization and prepayment, is relevant to mortgages, and therefore of particular importance to the FNMA gap model.

Rate sensitive liabilities can be defined similar to rate sensitive assets. Noting from the above discussion, that the majority of FNMA's liabilities are either short term notes, or debentures, the calculation of rate sensitive liabilities should be relatively straightforward given the maturity structure of the debt.

The next section of this paper will present the FNMA balance sheet for the end of 1983 with a breakdown of the estimated asset maturity structure and the corresponding yields on the assets. Also the liability side of the balance sheet will be developed with debt maturities and costs. The asset side of the balance sheet essentially consists of mortgages. The current status of the mortgage portfolio will be approximated using historical purchase and sale activity, and amortization and repayment assumptions. The liability or debt structure will be approximated using historical data on FNMA's borrowing, and current public documentation. After approximating the current balance sheet, a gap analysis will be conducted to measure the degree of interest rate risk. The initial gap model will use maturity as the measure of asset and liability life.

FNMA GAP ANALYSIS

The gap analysis in this study will be developed around the following repricing periods: 0 to 1 year, 1 to 3 years, 3 to 5 years, 5 to 10 years, and 10 years and greater. Within the structure of this repricing schedule few of FNMA mortgages fall

below the 10 year or greater period. It is known that the government insured mortgages, and the conventional mortgages, both residential and project, have original maturities of 30 years or more [some project loans have maturities of 40 years]. Under this parameter only mortgages that are still in existence and were purchased before 1964 would have present maturities of less than 10 years. In 1963, the FNMA total year end portfolio was $2.5 billion. Given amortization and prepayment a relatively small amount of the $2.5 billion balance remains at the end of 1983, and therefore this study will assume that the entire current portfolio is post 1963 with respect to origination. In other words, the study will begin the gap analysis assuming the entire mortgage portfolio has a maturity of 10 years or greater, except for adjustable rate mortgages, and second mortgages. Table 8 shows maturity yield and cost information for the FNMA balance sheet as of December 31, 1983. The top half of the table presents the assets, which include the mortgage portfolio, and other investments. The bottom half of the table presents the liability structure of the Corporation. The short term liabilities obviously fall within the 0 to 1 year band, but FNMA's long-term liabilities have a broad range of maturities and therefore fall across a wide range of bands. This is not true of the asset structure. The majority of the assets fall within the 10 year or greater band, while only the short-term investments and the adjustable rate mortgages fall within shorter maturity periods.

The adjustable rate mortgages have 30 year maturities, but rates are adjusted after 1, 3, or 5 years. Therefore the ARMs do not reprice as a traditional 30 year mortgage reprices. Before considering the prepayment or amortization of the ARMs it is necessary to distribute them in table 8 according to their readjustment period. Since there is no detailed information available about the adjustment period for the ARMs, it will be assumed that they are divided equally between 1, 3, and 5 years adjustable periods. The total $7,126 million of ARMs is distributed equally in the 0-1, 1-3, and 3-5 bands.

PREPAYMENT ASSUMPTIONS

The most difficult estimation in gap measurement is the adjustment for anticipated mortgage prepayment. Even though the majority of the mortgages in the FNMA portfolio are assumed to have original maturities of 30 years, they are likely, on the average, to prepay long before the scheduled maturity date. In treating all 30 year mortgages as though they were likely to provide principal and interest payments over a 30 year time horizon would lead to an incorrect measurement of the effective maturity of the mortgage assets.

In order to quantify the likelihood of prepayment on the various forms of mortgages in the portfolio it is necessary to analyze the factors that contribute to prepayment. The three factors that have the greatest influence on prepayment are origination year, geographical region, and the coupon rate on the mortgage relative to the present market rate. The cash flow on a mortgage consists of three parts: coupon interest, principal amortization, and prepayment. The first two of these are predictable quantities since they are determined by the characteristics of the mortgages making up the portfolio. Prepayments, on the other hand, are unpredictable, since they depend on the action of individual property owners, or mortgage borrowers. Although, if large numbers of mortgages are aggregated, as in the case of the FNMA portfolio, the prepayments that do occur are spread out over time. The prepayment level for an individual mortgage is all or none, but for a portfolio it represents a small percentage of the total. The mortgage portfolio will have prepayment activity spread over its life. The level of prepayment activity is termed the prepayment experience rate of a pool or portfolio. Prepayment experience is not constant over time. Rather, the prepayment experience tends to fluctuate with various economic factors, particularly market interest rates. Within a large portfolio of mortgages, such as FNMA's portfolio, the effect of demographics, legal, and geographical factors should be fairly stable over time. On the other hand, variations in market interest rates can have dramatic effects on prepayment as interest rates change. For example, the level of prepayments as a percentage of FNMA's mortgage portfolio in 1983 and in the first nine months of 1984 reflect a substantial increase from the unusually low levels of 1980 to 1982.[8] The moderation in interest rates experienced since 1982 resulted in a significant increase of prepayments of the higher rate loans in the Corporation's portfolio.

There are a number of techniques available to develop prepayment estimations. The FHLB estimates prepayment rates for all mortgage classes. They have attempted to refine their estimates by analyzing mortgages older than 10 years by the coupon rates. This allows for a more accurate estimate of the interrelationships between coupons and changing market rates. The FNMA technique uses mortgage pool price movements as an indicator of prepayment rates. The assumption is that expected yield on all pools is the same as the yield on pools selling at par, and that the expected average life of the mortgage pool is such that they will realize the same yield.[9]

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8 Ibid., p. 21.

9 Steven Goldstein and Eric Hemel. Gap Analysis: Using Section H of the Quarterly Report. Washington, D.C.: Federal Home Loan Bank, (July, 1984), pp. 5-6.

Table 8

Maturity Information
[millions of dollars]

	1984	85-86	87-88	89-93	94+	Total
	0-1 years	1-3 years	3-5 years	5-10 years	10+ years	
ASSETS						
Mort. Home:						
Gov. Ins. Conv.					30,999.9	30,999.9
Fixed						
Arm	2,375.4	2,375.4	2,375.5		32,533.3	32,533.3
Second						7,126.3
Project					2,385.4	2,385.4
Gov. Ins. Conv.					5,148.3	5,148.3
Fixed						
Arm					63.0	63.0
Second						
Other Inv.	1,689.4					1,689.4
LIABILITIES						
S-T Notes	10,833					10,833
Master Note	715					715
Debenture	15,289	23,450	16,995	4,945	404	61,083
Mort. Back Bond	23	110	24	243	25	425
Cap. Deb.		800		200	530	1,530
Conv. Cap. Deb.					28	28
Total	26,860	24,360	17,019	5,388	987	74,614

Another approach to estimating prepayment was developed in a study conducted by Merrill Lynch Capital Markets Mortgage-Backed Securities Research Department. Their study was entitled "Average Weighted Life Study of the Federal Home Loan Mortgage Corporation's Conventional Mortgage Portfolio." The study incorporated empirical data from thousands of individual mortgages, and through observation of this micro data, the study obtained correlations between prepayment, and other variables representing both micro and macro data. The significant product of the Merrill Lynch study is the development of an econometric model of mortgage payments.[10]

Both the FHLB approach, and the FHLMC model involve the use of individual mortgage coupons, and maturities. This type of data is not available from FNMA public documentation although FNMA historical purchase and sale activity could possibly lead one to a reasonable estimation of coupon and maturity structure of the Corporation's portfolio. But this method would require numerous assumptions as to year by year purchase and sales, past prepayments, and amortization. There is another prepayment estimation technique that is widely used, the FHA Experience Model. This model has its inherent problems which will be discussed, but given the data constraints in restructuring an accurate current mortgage portfolio for FNMA, the FHA Experience Model is probably the only feasible approach to use in this study.

The Federal Housing Administration [FHA] has accumulated a wealth of historical information on the mortgages that it insures. Each year HUD analyzes FHA data that extends back to 1957. The results of this analysis have become the basis for the FHA Experience Model. FHA experience takes the form of a decimal balance table, which indicates for each year in the life of a mortgage the probability that it will survive to that point [that is, that it will not default or prepay]. Table 9 presents the FHA experience measure for 1981.[11] The table represents the experience for the most commonly insured FHA mortgage loan, the section 203 single family loan. One obvious problem in using the table is that the experience analysis begins in 1957, and therefore complete 30 year data will not be available until

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10 Helen Peters and David Askin. Average Weighted Life Study of the Federal Home Loan Mortgage Corporation's Conventional Mortgage Portfolio: 1973-1980. New York: Merrill Lynch Capital Markets Mortgage-Backed Securities Research Department, (January, 1984).

11 Dexter Senft. "Pass-Through Securities," in The Handbook of Fixed Income Securities, ed. Frank Fabozzi and Irving Follack. Homeward, Ill.: Dow Jones-Irwin, 1983, p. 483.

1986. The final years of the table are therefore derived from extrapolation. Another problem that arises is the fact that the experience measure is built on FHA insured single family homes, and therefore its use on other types of mortgages may not be justifiable. The FHA experience model has its shortcomings, but for this study it provides a prepayment assumption technique that is practical because of data constraints.

Table 9

Historical FHA - Experience Decimal Balances
1981

FHA--Exp. as of year	Decimal balance	FHA-Exp. as of year	Decimal balance
0	1.000	16	.3954
1	.9888	17	.3684
2	.9517	18	.3416
3	.9009	19	.3150
4	.8496	20	.2891
5	.7984	21	.2639
6	.7468	22	.2397
7	.6979	23	.2166
8	.6519	24	.1975
9	.6110	25	.1742
10	.5749	26	.1550
11	.5300	27	.1372
12	.5075	28	.1208
13	.4772	29	.0999
14	.4488	30	.0790
15	.4223		

Source: Senft, Dexter. "Pass-Through Securities", in The Handbook of Fixed Income Securities, ed. Frank Fabozzi, and Irving Pollack [Homewood, Ill.: Dow Jones - Irwin, 1983] p. 483.

The FHA Experience Model will be used to estimate the prepayment schedule for the following mortgage types.

Home:
- Government Insured
- Conventional Fixed

Project:
- Government Insured
- Conventional Fixed

It is very difficult to estimate prepayment patterns on second mortgages and adjustable rate mortgages because they traditionally have not been as sensitive to interest rates because of contractual maturities and refinancing cost. The Federal Home Loan Bank projects an across the board 4% prepayment rate on these mortgages.[12] The effect of prepayments on the repricing characteristics of ARMs will be fairly minor since ARMs typically reprice within five years. The author is inclined to use the 4% prepayment rate recommended by the FHLB, except for the recent activity of these two mortgages. The relevant activity is presented in table 10. In both cases the repayments were rather large for 1983. 42.4% of the 1982 second mortgage balance was paid off in 1983. The ARMs experience was lower but 14.1% of the 1982 balance was repaid in 1983. FNMA's public records indicate that the rate of repayment on these two categories of mortgages continue to repay at a rate far in excess of 4%. The probable reason for this large payoff is the high contract rates that existed in 1982. The pay off of second mortgages in particular will probably continue at a high rate for 1984 and 1985. Therefore this study will use the following repayment rates on second mortgages and ARMs.

	Second Mortgages	ARMs
1984	20%	10%
1985	10%	4%
1986 to maturity	4%	4%

Table 10

Purchase and Repayment of Second Mortgages and ARMs since 1981

	1981	1982	1983
Second Mortgages			
Purchased	176	1,552	1,408
Repayment		92	658
Total Portfolio	176	1,635	2,385
ARMs			
Purchased	107	3,210	4,246
Repayment		29	452
Total Portfolio	107	3,332	7,126

Source: Guide to Debt Securities. Federal National Mortgage Association. [November 20, 1984], p. 21.

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12 Goldstein, p. 8.

AMORTIZATION ASSUMPTIONS

In order to calculate a repricing gap it is necessary to include the amortization of mortgages within the appropriate repricing periods. If the mortgage portfolio's individual coupons and maturities are known then an amortization calculation based on repricing periods is straight forward. For example, the quarterly Section H schedule mandate by the FHLB of all federally chartered thrifts presents the coupon and maturity information within the repricing periods. This type of information is not available in public form for FNMA, and therefore the maturity and coupons must be estimated.

The average maturity of the FNMA mortgage portfolio is currently 25 years. This figure is representative of the entire portfolio, and although initially startling, one can begin to understand the long average maturity by examining purchasing activity over time. Over 60% of the total portfolio has been purchased since the beginning of 1978.

This study has gone beyond the average maturity of the total portfolio and estimated both the average maturity and the average coupon of the two largest parts of the portfolio, government insured and conventional fixed rate home mortgages. Tables 11 and 12 show the derivation of the average coupon and average maturity of the government insured and conventional fixed rates, respectively. The use of this weighted average approach has its shortcomings, but given the availability of portfolio data this technique is probably the most feasible approach.

The average coupon and maturity derived in tables 11 and 12 will be used to establish an amortization schedule for these two classes of mortgages. Given the fact that there is not a similar detailed historical analysis of project loans, the same amortization assumptions will be used for project mortgages. The conventional fixed rate project mortgages have a 1983 balance of only $63 million, although the government insured category is more significant with a total balance of $5,148 million in 1983.

The amortization of the ARMs is not highly significant because they can be repriced within five years, and also because their average maturity for amortization calculation is very near 30 years and therefore the principal repayment will be relatively small.

The second mortgages will be amortized assuming a 15 year original maturity, and a coupon rate 1 point greater than the coupon rate on conventional fixed mortgages. Again, given the fact that the majority of the second mortgages have been originated in the last two years the principal repayment will not be very large in the 0-1 or 1-3 repricing periods.

Table 11

Average Weighted Coupon and Maturity
of FNMA's Government Insured
Home Mortgages

Year	Purchases	Weight	Coupon Rate	In Existence	Wgt. Coupon	Wgt. Life
1965	757	.014	6.10	18.5	.085	.259
1966	2,081	.039	6.24	17.5	.243	.683
1967	1,400	.026	6.35	16.5	.165	.429
1968	1,938	.036	6.53	15.5	.235	.558
1969	4,102	.076	7.12	14.5	.541	1.102
1970	4,777	.088	7.99	13.5	.703	1.188
1971	2,742	.051	7.70	12.5	.393	.638
1972	2,541	.047	7.53	11.5	.354	.541
1973	3,231	.060	8.19	10.5	.491	.630
1974	3,618	.067	9.55	9.5	.640	.637
1975	3,099	.057	9.19	8.5	.524	.485
1976	824	.015	8.82	7.5	.132	.113
1977	2,284	.042	7.96	6.5	.334	.273
1978	6,574	.122	9.70	5.5	1.183	.671
1979	5,388	.100	10.87	4.5	1.087	.450
1980	5,273	.098	13.42	3.5	1.315	.343
1981	859*	.016	16.31	2.5	.261	.040
1982	901	.017	15.31	1.5	.260	.026
1983	186	.003	13.11	.5	.039	.002

Average Coupon 9.10%

Average Life 9.1 years

Average Maturity 20.9 years

* $518 and $907 of sales in 1982 and 1983, respectively, are assumed to be 1981 coupons.

Source: Federal Reserve Bulletin: various issues.

Table 12

Average Weighted Coupon and Maturity
of FNMA's Conventional Fixed Rate
Home Mortgages

Year	Purchases	Weight	Coupon Rate	In Existence	Wgt. Coupon	Wgt. Life
1972	55	.001	7.64	11.5	.008	.012
1973	938	.023	8.30	10.5	.191	.242
1974	1,128	.028	9.22	9.5	.258	.266
1975	547	.013	9.10	8.5	.118	.111
1976	2,513	.062	8.99	7.5	.557	.465
1977	2,366	.058	8.95	6.5	.519	.377
1978	5,682	.140	9.68	5.5	1.355	.770
1979	5,410	.133	11.15	4.5	1.483	.599
1980	2,802	.069	13.95	3.5	.963	.242
1981	1,648*	.041	16.52	2.5	.677	.103
1982	5,883**	.143	15.79	1.5	2.258	.215
1983	11,702	.289	13.43	.5	3.881	.145

Average Coupon 12.27%

Average Life 3.5 years

Average Maturity 26.5 years

* The $1,896 mil. sale in 1982 is assumed to involve 1981 coupons.

**The $3,560 mil. sale in 1983 is assumed to involve 1982 coupons.

Source: Federal Reserve Bulletin: various issues.

The application of the prepayment and amortization assumptions, coupled with the maturity data in table 8, is used to generate the gap analysis in table 13. Each category of assets and liabilities is distributed across the repricing periods. The repricing categories when summed give the total rate sensitive assets and total rate sensitive liabilities. The totals will be used to measure the level of the gap. The gap measurement is quantified in table 14.

Table 13

Federal National Mortgage Association
Gap Analysis
December 13, 1983

Time to Maturity or Repricing

	0 to 1 years	1 to 3 years	3 to 5 years	5 to 10 years	10 yrs. or greater	Total
Assets						
Mortgages						
Home						
Gov. Ins.	2,296	4,305	3,883	8,658	11,858	31,000
Conventional						
Fixed	2,073	4,205	3,668	7,143	15,444	32,533
Arm	2,872	2,317	1,937			7,126
Seconds	528	359	246	539	713	2,385
Project						
Gov. Ins.	382	715	645	1,518	1,888	5,148
Conventional						
Fixed	5	9	8	19	22	63
Other Invest.	1,689					1,689
Total Rate Sensitive Assets	9,845	11,910	10,387	17,877	29,925	79,944
Liabilities						
S-T Notes	10,833					10,833
Master Notes	715					715
Debenture	15,289	23,450	16,995	4,945	404	61,083
Mort. Backed Bonds	23	110	24	243	25	425
Capital Deb.		800		200	530	1,530
Conv. Cap. Deb.					28	28
Total Rate Sensitive Liab.	26.860	24,350	17,019	5,388	987	74,614

As shown in table 14, the estimated unhedged gap in the 0 to 1 year repricing period is a negative $17 billion, and a negative $12.5 billion in the 1 to 3 year repricing period. These two periods are the most significant, especially when a large negative gap exists. The relative importance of the gap is best expressed through the gap as a percentage of total assets. For the 0 to 1 year repricing period the gap to total assets is negative 21.3%, and for the 1 to 3 year repricing period negative 15.6%, which results in a negative cumulative gap of negative 36.9% over the 0 to 3 year period.

The 0 to 1 year repricing category provides an opportunity to evaluate the results of the model. The asset repricing in the 0 to 1 year period corresponds to 1984, and preliminary asset repayment data for the first nine months of 1984 are available.[13] Using the third quarter results and extrapolating to the end of the year allows a comparison of the estimations in table 13 to the actual repayments to FNMA in 1984. The estimations are relatively accurate with the exception of two mortgage types, the conventional fixed rate mortgages, and the government insured project mortgages. The first category, conventional fixed rate is more significant because the category accounts for approximately 40% of the mortgage portfolio. The results in table 13 indicate $2,073 million of repricing for the conventional fixed rates in 1984, the 0 to 1 year repricing category. The preliminary data provided through FNMA public documentation suggests that close to $3,000 million of conventional fixed rate home mortgages will repay in 1984.[14] This significant underestimation is likely occurring because of underestimation of

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[13] Guide to Debt Securities, p. 21.

[14] Ibid.

Table 14

Gap Measures

	0 to 1 years	1 to 3 years	3 to 5 years	5 to 10 years	10 years and greater
Unhedged Gap	-17,015	-12,450	-6,632	12,489	28,938
Unhedged Gap to Total Assets	-21.3%	-15.6%	-8.3%	+15.6%	+36.2%
Cumulative Unhedged Gap	-17,015	-29,465	-36,097	-23,608	+5,330
Cumulative Unhedged Gap to Total Assets	-21.3%	-36.9%	-45.2%	-29.6%	+6.6%
Total Rate Sensitive Assets to Total Rate Sensitive Liabilities	36.7%	48.9%	61.0%	331.0%	

prepayment, not amortization. The prepayment estimates were derived from the FHA Experience Model for 1981. The decimal balances are obviously not large enough in the beginning years. The table is not reflecting the higher prepayments in 1984 due to the historically high mortgage rates of 1981 and 1982. The problem with the government insured project mortgages is less significant because the category is not large relative to the total portfolio. The estimate in table 13 is larger than the current data for 1984. Again, the problem would seem to rest with the FHA Experience Model, which in this case is overestimating the prepayment in this category.

COMMENTS ON DURATION

The above model has term to maturity as the measure of asset and liability life. Since the assets of FNMA are primarily mortgages, the mortgage portfolio was adjusted for prepayment. This is the most popular technique for performing gap analysis. Term to maturity has the advantage of being easily identified and measured. Since the FNMA assets are primarily mortgages the cash flow is spread throughout the life of the assets, as would not be the case if it was primarily a bond portfolio. The advantage of a duration model is that it considers the present value of the cash flows over the life of the asset.

Table 13 presented the cash flow distribution for the assets within the repricing bonds. The results are as follows:

0 to 1 year	1 to 3 years	3 to 5 years	5 to 10 years	10 years and more
		[in millions of dollars]		
9,845	11,910	10,387	17,877	29,925

By using the midpoint of the repricing periods it is possible to estimate the average weighted life of the cash flow from the portfolio. This is presented in table 15.

Table 15

The Average Weighted Life of Assets

	Cash flow weight	Midpoint in years	Weighted life
0-1 years	.123	.5	.062
1-3 years	.149	2	.298
3-5 years	.130	4	.520
5-10 years	.224	7.5	1.68
10 and greater	.374	17.5	6.55

Average Weighted Life = 9.1 years

The majority of the mortgages in the portfolio had an original maturity of 30 years with an assumption of prepayment in 12 years. The present average life of the mortgages is approximately 25 years. But the aggregate cash flow from the portfolio has an average weighted life of 9.1 years as shown in table 15.

The duration of the portfolio will be shorter than the average weighted life because of discounting the cash flow. The specification for the duration measure in this study is the measure derived by Macaulay which discounts all flows by the prevailing average yield to maturity on the asset being measured.[15] Therefore the study is assuming a flat yield curve. The yield on mortgages purchased in 1983 was 12.65%. Table 16 presents the duration analysis of the repricing periods cash flow. The duration of the cash flows is 4.68 years which is

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15 Frank Reilly and R. Sidhu. "The Many Uses of Bond Duration." Financial Analysts Journal. July/August, 1980, p. 12.

significantly less than the average weighted life of 9.1 years. The duration of the liabilities is based on a 10.07% cost of debt in 1983. The duration of the liabilities is two years.

COMMENTS ON INTEREST RATE RISK MANAGEMENT

The Federal National Mortgage Association has a significant negative gap. A 100 basis point permanent movement in interest rates produce approximately $100 million after tax effect. The record shows that over the last three years FNMA has made an effort to restructure its balance sheet, and it is important that this effort continues. It would appear that the Corporation has two problems: achieving a competitive return on equity, and restructuring the balance sheet and obtaining other sources of income to reduce the volatility of earnings.

Table 16

Duration Analysis

ASSETS

Period	Mid-Point	Cash Flow	Present Value of Cash Flow	Present Value % Total Value	Duration
0-1	.5	9,845	9,276	.257	.129
1-3	2	11,910	9,385	.260	.520
3-5	4	10,387	6,450	.178	.712
5-10	7.5	17,877	7,317	.202	1.515
10 and greater	17.5	29,925	3,722	.103	1.803
				Duration	4.68 years

LIABILITIES

0-1	.5	26,860	25,602	.426	.213
1-3	2.0	24,360	20,107	.334	.668
3-5	4.0	17,019	11,595	.193	.772
5-10	7.5	5,388	2,624	.044	.33
10 +	17.5	987	184	.003	.053
				Duration	2.04 years

Due to increasing borrowing costs FNMA began losing money in 1981, and incurred a $105 million loss in 1982. With the reversal of rates in 1983 FNMA continued to have a negative interest rate spread but showed a profit due to other income. Given the sharp decline in short term rates at the end of 1984 FNMA should have a profit for 1984, and if rates remain relatively lower in the first two quarters of 1985 the Corporation

will show a significant profit. The negative gap causes serious earning problems as interest rates rise, but it has a positive impact on earnings as rates decline. FNMA's dilemma has been the attempt to restructure in an environment of poor earnings. It is often very difficult to restructure in a period of poor earnings because rates are usually relatively high when earnings are poor and therefore restructuring can be costly, compounding the earnings problem. The last quarter of 1984, and the first quarter of 1985 provide an opportunity for restructuring at a reasonable cost due to the relatively lower interest rates that currently exist.

A crucial area of gap management is on the liability side of the balance sheet. An entity such as FNMA that has a significant negative gap must extend the average maturity of its liabilities. FNMA must issue liabilities with extended maturities when there are opportunities to do so at favorable rates while relying on lower-cost, short term borrowings in periods of high interest rates. The area of liability management offers FNMA opportunities that do not exist for thrift institutions. FNMA can do a significant degree of debt financing in the intermediate-term agency market, specifically 3 to 7 maturities. Thrift institutions are funded largely by small, local consumer deposits which are short term in nature, and through certificates of deposit. Whereas the maturity of deposits at thrift institutions is approximately 6 months, FNMA outstanding debentures, which constitute more than 50% of debt outstanding had a maturity of 2 years 10 months at the end of 1983. The Corporation needs to extend the maturity of its debt to reduce interest rate risk.

The asset side of the balance sheet also offers numerous opportunities for restructuring. Since 1981 FNMA has actively purchased adjustable rate mortgages. The 1983 portfolio shows adjustable rates at about $7 billion in a total portfolio of $76 billion. As of 1983 adjustable rate mortgages made up about 10% of the total portfolio, if the percentage can begin to approximate 20 to 25% of the total portfolio, this will have a significant impact on reducing the overall maturity of the mortgage portfolio. The Corporation has also purchased second mortgages since 1981. Since the maturity on seconds is usually 10 to 20 years their acquisition will tend to bias down the overall maturity of the portfolio.

The mortgage backed security market has grown dramatically in the last decade. FNMA began issuing guaranteed mortgage pass through certificates in 1981. The initial certificates were backed by conventional pools, but FNMA subsequently has issued similar certificates representing FHA/VA mortgages, and ARMs. The guaranteed mortgage pass through enables the Corporation to further its statutory purpose of increasing the liquidity of

residential mortgages without requiring that it assume the financing or spread risk on the pooled mortgage loans. The other advantage of the mortgage backed security to the guarantor is the fees received from their origination, and guaranty. The fee income can help to insulate earnings from interest rate movements.

A final asset management consideration is the sale of mortgages from the portfolio. FNMA's sale activity was rather insignificant until 1982, and 1983. Given the moderation of interest rates in the 4th quarter of 1984, and the 1st quarter of 1985 there should be opportunities to sell mortgages without suffering large losses. The sale of a long term asset is probably the most direct way to reduce the average maturity of a portfolio. Also, given moderating interest rates and a negative gap, FNMA's earnings statement for the fourth quarter of 1984, and the first quarter of 1985 should show improved earnings. This provides an opportunity to sell some mortgages at a moderate loss.

The use of the futures market, and the options on futures provides a valuable tool for interest rate risk management. The Federal National Mortgage Association has been an active participant in these markets since 1982. FNMA has limited its future market activity to hedging. All futures positions assumed by the Corporation are related to a cash position, or an expectation of a change in its cash position. FNMA's hedging involves two motives. First, the Corporation uses the futures market to hedge optional delivery standby commitments. FNMA issues optional delivery standby commitments by selling a put option to lenders, giving them the right to sell mortgages to the Corporation at a fixed price over a given period of time. FNMA is taking a delivery risk against these commitments, and this risk can be hedged by purchasing put options. FNMA is presently using the put option on Treasury securities. The cost of the hedge is used to set the commitment fee that FNMA will charge the primary market lenders.

Secondly, FNMA has conducted micro hedging, particularly on the liabilities side of the balance sheet. FNMA has used the futures market to lock in a cost on debt prior to the actual issuing of the debt instruments. There is no evidence that the Corporation has attempted macro hedging, that is, actual hedging of the gap. FNMA has developed a hedging department that has had hands on experience in the futures market. The Corporation should investigate the feasibility of macro hedging, at least with respect to the purchase of low premium options that would help to offset the earnings impact of major changes in interest rates.

This study has focused on the interest rate risk exposure of the Federal National Mortgage Association's balance sheet. In many respects FNMA takes on the characteristics of a giant thrift institution, although there are major differences which have been pointed out in the study. The testing of a gap model indicates that FNMA has a significant negative gap in its short repricing periods. Given the negative gap FNMA's earnings are sensitive to interest rate movements. The Corporation has experienced losses in 1981, and 1982, primarily due to the balance sheet mismatch. Although there is evidence that FNMA has made a commitment to reduce the mismatch. This study would conclude that until the Corporation accomplishes further significant balance sheet restructuring it will remain susceptible to interest rate risk.

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Comment On James J. Clarke, "An Interest Rate Risk Analysis Of The Federal National Mortgage Association"

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In his presentation, Professor Clarke examines the problem of FNMA risk-taking and what to do about it. He develops three kinds of information:

1. Factual descriptions,

2. Accounting measurements, and

3. Policy recommendations.

I have nothing but praise for the way that Professor Clarke lays out the facts. He provides an excellent review of the recent evolution of FNMA's financial-intermediation activities. This review emphasizes the similarity that exists between the balance sheets of FNMA and thrift institutions. Both operate with a high degree of leverage and use short-term debt to support a portfolio of mortgage loans. He goes on to construct a one-time measurement of FNMA's exposure to interest-rate risk as of the end of 1983 and to show that FNMA could reduce its exposure to interest-rate risks either by increasing its equity capital, shortening its assets, or lengthening its liabilities.

My discussion is going to focus on information Professor Clarke wasn't able to supply--information that is necessary to place the policy problem of FNMA risk-taking in proper perspective. This complementary information pursues the analogy between S&Ls and FNMA to demonstrate the existence of substantial unintended federal subsidies to FNMA risk-taking. It is drawn from a still-confidential study of FNMA risk-taking I am undertaking with the valuable assistance of Chet Foster of HUD.

My presentation divides into three parts:

1. Constructing an explanation of how subsidized federal guarantees expand FNMA risk-taking. This explanation follows from the most fundamental principles of corporate finance.

2. Communicating the qualitative pattern of Chet Foster's and my preliminary estimates of the variation since 1978 in the cost of federal guarantees of FNMA debt and in FNMA's exposure to interest-rate risk. These estimates confirm the hypothesis that, given unpriced federal guarantees of FNMA debt, expanded FNMA risk-taking is a rational managerial response to FNMA's de facto insolvency.

3. Reframing the operative policy problem as one of establishing explicit or implicit price controls on the flow of risk-taking subsidies to FNMA and outlining at least a few of the ways that subsidization of FNMA risk-taking could be reduced or eliminated.

1. How Is FNMA Risk-Taking Subsidized?

Except for the $2.25 billion explicit line of credit that Professor Clarke has described, Treasury guarantees are implicit and conjectural. Although neither the Treasury nor the Federal Reserve is specifically authorized to prevent or soften the ongoing insolvency of FNMA, the existence of predictable and strong political pressures for rescuing FNMA are recognized by sophisticated investors. If not, FNMA would have long since found it impossible to finance its portfolio expansion profitably. If it persisted in its effort to expand, rational lenders would have sought collateral and other protections that would have driven what is a de facto insolvent FNMA into bankruptcy.

Some FNMA officials refuse to acknowledge that FNMA's de facto insolvency imposes an implicit liability on the U.S. Treasury. Focusing only on explict cash flows, they claim that "FNMA has never cost the Treasury a cent." But this claim is economically fallacious. It exploits a conceptual confusion in the way the value of governmental guarantees are measured in the federal budget. Contemporary financial accounting for government credit programs and governmentally guaranteed enterprises measures the cost of guarantees in terms of cash flows they occasion during a given period rather than in terms of the contingent cash flows these commitments threaten to occasion in the future. Under this accounting system, it always seems profitable in a given period for an agency or government-sponsored corporation to sell a new guarantee for the price the market will pay it for issuing that guarantee. A guarantee occasions no cash flows from the guarantor until and unless the guaranteed party fails to fulfill one or more contractual obligations. For this reason, a guarantor should in principle equate the current value of its guarantee to that of a fund of reserves sufficient to "cover" these future flows. To a borrower, the value of a credible government guarantee may be conceived as the discounted present value of the lower default premium it has to pay on the guaranteed debt.

The underlying policy issue is the uncontrolled subsidization of FNMA. Exploiting the analogy between S&Ls and FNMA, it is possible to make three comparisons that Professor Clarke did not make:

a) Between subsidies to risk-taking offered FNMA and S&Ls under given patterns of implicit government guarantees.

b) Between Treasury and FSLIC behavior as guarantors of interest-rate risk.

c) Between the need for deposit insurance reform and the need for controls on FNMA risk-taking.

By financing asset holdings of relatively moderate default risk (say Baa bonds) with government-guaranteed debt, a guaranteed institution can earn about 100 to 150 basis points per year on each dollar it processes. The FSLIC charges an explicit premium of 8-1/3 basis points (which it is threatening to raise in 1985 to 12-1/2 basis points) and imposes additional controls on client risk-taking that may be interpreted as a series of implicit premiums. However, in the face of the interest volatility experienced over the last decade, this control system has lost much of its bite.

In contrast, the Treasury charges no explicit or implicit fee for the guarantees it provides on FNMA debt. The result is a series of strong arbitrage incentives, in which the only constraints on FNMA risk-taking are the need to serve its countercyclical stabilization policy mission that makes it a quasi-agency and the fear that too aggressive pursuit of subsidized guarantees might induce administrative controls on its future risk-taking. FNMA stockholders want the firm's managers to reach out for as much leverage and interest-rate risk as they can grab without provoking elected officials into imposing actuarially fair user fees or direct restraints on the firm's capacity to take portfolio risk. Although FNMA managers have additional responsibilities, it would be unethical for them to ignore their stockholders' clear economic interests.

2. Accounting for the Value of Federal Guarantees

To measure the value of federal guarantees to FNMA stockholders it is necessary to think in terms of the firm's augmented balance sheet. The accounting profession's standard balance sheet records the book value of selected assets and liabilities: those that are recognized by GAAP. We may call these assets and liabilities "bookable" ones and contrast them with sources of value (such as leases and guarantees) that are "off-balance sheet" or unbookable.

Augmented balance sheet looks at the market value of all bookable and unbookable assets (A) and liabilities (L). In the process, the basic book-value identity that defines a firm's net worth in terms of the book value (BV) of assets and liabilities, NW=BV(A)-BV(L), expands into the following market-value identity for the firm's stock value, S:

$$S=(A+A')-(L+L').$$

A. Qualitative Pattern of Market-Value Estimates

Using reliable and conservative valuation techniques, Chet Foster and I have appraised the market value of FNMA assets and liabilities at seven dates (1978-84) and combined these figures

with data on S to estimate the value of (A'-L'). The difference between S and (A-L) equals the net market value of unbooked items of all sorts, including any franchise values associated with FNMA operations. On the hypotheses that loan commitments net of futures positions have zero duration and that the competitive expansion of mortgage-backed securities and electronic mortgage-origination networks is squeezing these franchise values toward zero, we identify the net impact of off-balance-sheet items, 0=(A'-L') with the value of unbooked Treasury guarantees. This hypothesis is further supported by the low level of 0 to 1978 and the sensitivity to the subsequent level and volatility of interest rates that our estimates of 0 display.

Our figures show the value of the guarantee bursting past the value of FNMA's $2.25 billion explicit line of credit in 1979, peaking at over $12 billion in 1981, falling to about $7.5 billion in 1983 and rising about $0.5 billion in the first half of 1984.

Although our prepayment model is interest-sensitive, our preliminary estimate of the duration of FNMA mortgage assets, D_A, in December 1983 agrees to one decimal place with that of Professor Clarke. However, Chet Foster's and my estimate of the duration of FNMA liabilities, D_L, at the date is roughly four months shorter than his 2.04 years. This is probably due to FNMA's concentration of liabilities below the midpoints of Professor Clarke's 0-1 and 1-3 year buckets. Our more comprehensive figures show <u>both</u> D_A and D_L to have been falling on average since 1978, but not in every year. Moreover, our data indicate that the <u>gap</u> in portfolio duration rose sharply in 1979 and, despite the autonomous shortening effects of rising interest rates, was maintained at over 4 years until 1982. Although the gap reached a low point of three years in December 1983, in the first half of 1984 the gap increased by a few months. Combined with data on leverage and portfolio size, this is not a picture of a corporation striving singlemindedly during these years to curtail its risk-taking activities. Concern for risk-reduction has been tempered by a desire to position the corporation to earn its way back to <u>de facto</u> solvency in the event of a substantial downswing in interest rates.

B. <u>Value of Guarantees</u>

It is important to see that sharing of interest-induced gains and losses between Treasury and stockholders is far from symmetric. The Treasury's exposure to interest-rate risk comes from FNMA's duration gap, but the asymmetric sharing of gains and losses is rooted in the market-value insolvency of FNMA. During 1978-81, as the accumulated market loss in bookable (A-L) grew by about $11.3 billion, the value of its stock decline by only $0.4 billion. This is a mere 3.5 percent of the firm's

loss. During 1981-82, as the market value of FNMA's bookable net worth gained $9 billion, S increased by $1 billion or 11.1 percent of the portfolio improvement. The figures suggest that, during portfolio upswings, FNMA stockholders stand to gain about three times as high a proportion of portfolio gains as they stand to lose during downswings.

The size of the subsidy to FNMA may be measured in either of two ways: as a stock or as a flow. The market value of FNMA's implicit Treasury guarantee is obviously larger than the annual cost of financing the guarantee. The current annual cost has two components: (a) the change in the market value of aggregate guarantees from yearend to yearend, and (b) the cost of financing the guarantees, which we may estimate as the product of an opportunity-cost interest rate and the current market value of the guarantee. Using an 11 percent interest rate (employing the slightly higher interest rate paid of FNMA debt would capture the riskiness inherent in the conjectural nature of the guarantee) and our rough estimate of the mid-1984 value of the guarantee, we may put the annualized financing cost at between $1.0 billion and $1.5 billion. However, in the first six months of 1984, the jump in the value of the guarantees was 3 to 4 times this amount. I maintain that if FNMA were to reimburse the Treasury each year for the ex post value of these two cost components, the subsidy cost be eliminated. To guard against a possible FNMA bankruptcy, FNMA's liability would have to be backed up by contingent claims extending its liability to FNMA's stockholders, as in provisions for double liability that applied until the mid-1950's to owners of national-bank stock.

Analyzing this proposal should clarify the inadequacy of the administration's proposal to impose a flat 5 to 8-1/3 basis-point user fee on FNMA debt. Measured as a percentage of FNMA's aggregate debt in June 1984, the interest cost alone amounts to 120 basis points per annum. By strengthening the perceived quality of the federal guarantee, the administration's flat-rate proposal could easily increase the flow of gross subsidies by 15 or 20 basis points.

3. Policy Recommendations

This brings us to the policy problems these data expose. Under current arrangements, FNMA risk-taking is subsidized, and control over the size of the subsidy is effectively left to the discretion of FNMA management. Oversight and review of FNMA risk-taking has been so inadequate that, in the face of increased interest volatility, the subsidy has outgrown its intended limits.

FNMA's freedom from guarantor-imposed controls contrasts sharply with restrictions placed on the behavior of federally insured deposit institutions. The FDIC and FSLIC attempt to

manage their exposure to their clients' voluntary risk-taking by manipulating a combination of explicit and implicit premiums designed to ration disagreeable forms of risk-taking by their clients.

In FNMA's case, although HUD has oversight responsibility, a meaningful framework for imposing explicit or implicit premiums has yet to be fashioned. Currently, the need to serve housing interests and the fear of provoking substantial future premiums remain the only systematic checks on FNMA's opportunities for exploiting the Treasury's implicit guarantees of its debt by expanding its leverage, unhedged positions, portfolio size, and exposure to credit risk. FNMA has repeatedly bet more than its privately supplied equity account on the course of future interest rates. Because it has persistently short-funded and greatly leveraged its holdings of mortgage assets, it has stood to win from interest-rate declines and to lose from interest-rate increases. Our data indicate that FNMA's strategy was to increase its exposure to losses from interest-rate increases in 1979-81 (i.e., its leverage, the size of its mortgage holdings,and the degree of its short-funding) when losses on its existing bets drove its net-worth position more deeply under water. A milder increase in exposure occurred in the first half of 1984. Although FNMA has recorded gains over the last few months, its bets remain on the table and the financial roulette wheel spins anew each day.

The range of policy solutions has three main branches: explicitly pricing the guarantees, disavowing them, or installing more effective administrative procedures for controlling the subsidy without eliminating the guarantee. To take the initiative away from FNMA managers, the Treasury must either find a way to collect an explicit price for its guarantees that is high enough to make voluntary risk-seeking unprofitable for FNMA or develop a set of administrative controls on FNMA portfolio behavior that is strong enough to make inappropriate risk-seeking less feasible. In principle, several ways exist to implement either a pricing or a control scheme.

Five classes of policy procedures might be followed in principle:

1) Develop a system of ex ante pricing or ex post settling up. (Ex post settling up could proceed by giving the Treasury warrants on FNMA stock or employing the Kane-Foster market-value accounting model to calculate a monthly or quarterly bill for the Treasury's guarantee services.)

2) Institute effective controls on FNMA's duration gap and portfolio growth. (These could be phased in gradually.)

3) Impose requirements for 100 percent insurance of FNMA's unhedged positions. (Subordinating new FNMA debt to old could be used as a step in this direction.)

4) Establish an asset-liability committee (ALCO) at HUD to manage FNMA exposure to interest-rate risk.

5) Give public-interest directors a dominant position on FNMA's corporate board.

It is a shame that political and practical problems make elected officials unreceptive to any of these solutions today. Although securities markets and private insurance companies make comparable ex ante pricing decisions every day, to bureaucrats and politicians an adequate pricing solution seems unacceptably hard to execute and to defend politically against what promises to be implacable opposition. While workable in principle, milder control options face potentially crippling enforcing problems and threaten (by increasing government involvement) perversely to strengthen the perceived value of FNMA's implicit guarantees.

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Fannie Mae And Its Relationship To Low- And Moderate-Income Families

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I. Introduction

The purpose of this paper is to examine various issues connected with the question of how activities of the Federal National Mortgage Association (Fannie Mae) relate to the national goal of providing adequate housing for low- and moderate-income families. As will be seen, the question is multi-faceted, and does not admit simple answers. Rather, the approach of this paper will be indirect, focusing on various aspects of the question. Appraisal of the issues is further complicated by a lack of data, and problems of data comparability. Any simple definition of 'adequate' attention by Fannie Mae to the problems of low- and moderate-income families is likely to be Procrustean, and the answer to the bottom line question "Is Fannie Mae doing enough?" will appear quite different to different observers. Rather than attempt to provide definitive answers, this paper will attempt to raise the issues surrounding the question. Available data will be utilized to provide some evidence relating to the issues, but if the paper removes at least some of the red herrings from the discussion, it will have at least a degree of success. Where appropriate, and especially in the concluding section, the opinions and assessments of the author will be put forward.

The paper will proceed as follows: First, the legislative and regulatory background of Fannie Mae's connection to the "low-mod" question will be examined. Second, the history of Fannie Mae activity in this area will be discussed, with a view toward how these activities relate to its current role. Third, the definition and operationalization of the term "housing for low- and moderate-income families" will be addressed, and current definitions critiqued. Fourth, the impact of Fannie Mae's "major" activities--portfolio transactions and mortgage backed securities--on low- and moderate-income families will be evaluated. Next, several "special" Fannie Mae programs relating to these families will be examined. Finally, the paper will conclude with an overall assessment on how Fannie Mae's activities, present and future, mesh with the goal of providing adequate housing for low- and moderate-income families. It should be emphasized once again that the purpose of the paper is more to raise the issues than to dispose of them. While the paper is admittedly superficial in some respects, it is hoped it will provide a useful vehicle for discussion of the issues.

II. Legislative and Regulatory Background

The Federal National Mortgage Association Charter Act,[1] which separated Fannie Mae into a privately owned corporation and the government-owned Government National Mortgage Association (Ginnie Mae), states as its basic purpose "to establish secondary

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[1]Title III of the National Housing Act, 12 U.S.C. 1716 et seq.

market facilities for home mortgages," and directed FNMA to "provide supplementary assistance to the secondary market for home mortgages by providing a degree of liquidity for mortgage investments, thereby improving the distribution of investment capital available for home mortgage financing." Thus, the basic purpose of Fannie Mae was, and is, to help maintain a secondary market in mortgages. In addition, the Act provides that "The Secretary of Housing and Urban Development shall have general regulatory power over the Federal National Mortgage Association and shall make such rules and regulations as shall be necessary and proper to insure that the purposes of this title are accomplished . . . The Secretary may require that a reasonable portion of the corporation's mortgage purchases be related to the national goal of providing adequate housing for low- and moderate-income families, but with reasonable economic return to the corporation. The Secretary may examine and audit the books and financial transactions of the corporation, and he may require the corporation to make such reports on its activities as he deems advisable . . . ."[2]

Fannie Mae thus is given an additional responsibility, subordinate to its secondary market activities--that of assisting low- and moderate-income families. Until recently, the primary vehicle for supporting the secondary market was Fannie Mae's portfolio transactions, that is, the purchase of mortgages for portfolio, financed by the issue of debentures and other securities that are perceived by the market to have "agency" status--principal and interest are considered to have the same degree of safety as the issues of government agencies, which have government backing. Purchases are the outcome of commitments, which bind FNMA to purchase a certain volume of mortgages at a stated yield. It should be noted that it is the act of making commitments that establishes the secondary market. With a commitment as a backdrop, mortgages can be traded regardless of whether Fannie Mae actually purchases the mortgages. This is to say the effect of the commitment process is not fully measured by portfolio purchases by FNMA. Mortgagors receive the benefits of this kind of secondary market activity even if FNMA does not purchase their particular mortgages. Indeed, most mortgagors do not know if their mortgage has been purchased, since the mortgage may continue to be serviced by the originator. Until recently, Fannie Mae purchases conferred the attribute of assumability on mortgages, in spite of due-on-sale clauses, and this provided a reason to check on FNMA ownership, but this reason no longer exists. The effects of the commitment process on individual mortgagors is hard to measure, other than through the overall effect of the secondary market on interest rates. Thus, while the Charter Act refers to actual mortgage purchases, this may not be entirely appropriate.

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[2]Section 309 (h), Charter Act.

The Department of Housing and Urban Development has interpreted "housing for low- and moderate-income families" in various ways. The Section 8 program uses the terms "low" and "very low" income to refer to families whose incomes fall below 80 percent and 50 percent of area median incomes, respectively. In 1978, when the regulations regarding Fannie Mae were promulgated, "housing for low- and moderate-income families" was defined as

> (1) Any housing financed by a mortgage loan insured by FHA under section 221, 235, 236, or 237 of the National Housing Act;
>
> (2) Any housing project with respect to which the owner has entered into a Housing Assistance Payment Contract, or an agreement to enter into such a contract, pursuant to which eligible families in not less than 25 percent of the dwelling units of the project will receive Housing Assistance Payments under Section 8 of the United States Housing Act of 1937; and
>
> (3) Any single-family dwelling (including a dwelling unit in a condominium or planned unit development project) purchased at a price not in excess of 2.5 times the median family income (as most recently defined by the Secretary) for the Standard Metropolitan Statistical Area so designated by the Department of Commerce, or county not in such Area, in which the dwelling is located.

The 1978 regulations focused on conventional mortgages (see Appendix) in effect accepting all FHA and VA mortgages without further scrutiny, regardless of whether they were insured under the programs listed above. Whenever the percentage of conventional mortgages for low- and moderate-income families fell below 30 percent of all conventional mortgages purchased annually, the Secretary could establish an annual goal for such purchases. Thus, the 30 percent rule served as a trigger that might bring about a goal, but was not necessarily the goal itself. It should be noted that the original proposed rule referred to median housing price, rather than housing priced not in excess of 2.5 times area median incomes, a point that will be discussed later. Evaluation of Fannie Mae purchases in 1978, by HUD, estimated that 36.3 percent of mortgages met the standard of 2.5 times area median incomes. Estimation of the percentage was required because data on purchase price was not provided for a number of mortgages.[3] Fannie Mae's estimate was 33.5 percent for 1978, and Fannie Mae later reported that in 1979, the percentage was 25.7, falling somewhat short of the standard. It should be noted that

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[3]Unpublished paper, U.S. Department of Housing and Urban Development, "Analysis of FNMA's Purchases of Conventional Home Mortgage Loans in 1978," 1979.

1979 was a time of rising interest rates, which tended to push lower income families out of the market, a point to which this paper will return later. By 1980, the percentage of conventional loans meeting the HUD criterion had risen to 29.2 percent,[4] although this was probably an understatement, since 1979 median incomes were used in the calculation rather than the higher 1980 median incomes.

The 1978 regulations referred to central city location of mortgaged properties (outside the scope of this paper) as well as housing for low- and moderate-income families. Because of these requirements, Fannie Mae was directed to provide quarterly reports to HUD on mortgages purchased, including Census location codes and mortgagor incomes. While mortgagor incomes were not used to determine whether the mortgagors were low- and moderate-income families, the data could have been used to verify the "2.5 times median income" standard and might have allowed a better definition of "housing for low- and moderate-income families." Nonetheless, in 1982, Fannie Mae requested that HUD waive the requirement for the collection of certain data, including location codes and mortgagor incomes. The request was accepted by HUD, on the grounds that the regulations had caused unnecessary reporting burdens for the corporation as well as those selling mortgages to Fannie Mae. Thus, information was not available on whether Fannie Mae has met the '30 percent rule' since 1980. (See the appendix for the required reports and data required.)

Another important constraint on Fannie Mae is the "conforming limit," established by the Charter Act.[5] Currently, the maximum mortgage loan that FNMA may purchase is $115,300 for a one-family unit, $147,500 for a two-family unit, $178,200 for a three-family unit, and $221,500 for a four-family mortgage. Loans above these limits are termed "non-conforming loans" and since they are not eligible for FNMA purchase, they tend to raise the average of all loans originated in the U.S., compared to loans purchased by Fannie Mae. The effects of the conforming limit will be considered later in this paper.

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[4]Fannie Mae estimates of the percentages of loans meeting the standards are from letters to the Department of Housing and Urban Development from the General Counsel of Fannie Mae, dated August 14, 1979; May 22, 1980; and May 6, 1981.

[5]Section 302 (b) (2) of the Charter Act.

III. Past Fannie Mae Activities Regarding Low- and Moderate-Income Families[6]

Fannie Mae has engaged in a number of activities aiding low- and moderate-income families in the past, and this section will examine some of them. History may or may not be a useful guide to the future, but the purpose of this paper is not entirely to ask what Fannie Mae has done for "us" lately. "Lately" has been a time of tremendous financial stress, not only for the housing finance industry but for Fannie Mae in particular. Activities that may have been feasible in past years could threaten the financial condition of the corporation in more recent times. Accordingly, it is only fair to discuss some of these past efforts. While it can't be concluded that a more profitable Fannie Mae will engage in the same kinds of activities at some future time, the existence of these past efforts makes it harder to dismiss the possibility.

The Section 235 homeownership program and the Section 236 rental housing program were authorized at the same time that Fannie Mae became a wholly private corporation in 1968. Both of these programs were designed to help low-income families, and although the programs seem severely flawed in retrospect, they were sincere attempts to provide housing for lower income families. During the early years of the program, in spite of FHA insurance, lenders were reluctant to originate and hold these mortgages. Fannie Mae agreed to provide support for these programs through the creation of a secondary market in 235's and 236's. Up to the point where the programs were suspended by the government, FNMA issued commitments for 98 percent of the 236 mortgages and 59 percent of the 235's. Through 1977, Fannie Mae had actually purchased 65 percent of the 236 mortgages and 46 percent of the 235 mortgages. This can certainly be termed a major early effort by Fannie Mae to help meet the goal of "providing adequate housing for low- and moderate-income families."

Another effort in this area related to the Ginnie Mae tandem plan. Ginnie Mae would buy FHA-insured project mortgages, bearing below-market interest rates, at par, then resell the mortgages at a lower price that would make them attractive to investors. Fannie Mae agreed at that time to buy the mortgages at a pre-established price, if presented to FNMA for purchase. The pre-established price tended to be above the average market prices for such mortgages, so that FNMA was implicitly subsidizing the sale of the mortgages. The magnitudes of these implicit subsidies were

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[6]This section relies heavily on the report entitled "Serving the Nation's Homebuyers, Housing Industry, and Housing Finance System: The Benefits of Fannie Mae," Federal National Mortgage Association, December 1984.

not reported, so it is hard to judge their impact. The qualitative effect was to lower the subsidy cost to the government. While the subsidy did not go directly to project sponsors, the effect of this purchase plan was to make the tandem plan more workable, and in this way Fannie Mae did assist in the provision of housing for low- and moderate-income families.

In addition to these programs that directly focused on low- and moderate-income families, Fannie Mae has undertaken a number of smaller programs of various types that have had some impact on these families. Once again, it is very difficult to gauge the overall impact of these activities. The programs can be described as experimental or pilot programs, and some have grown into standard FNMA programs, such as the second mortgage program. For others, until they become more substantial, they are hard to categorize, but any efforts in this regard indicate at least some FNMA concern for housing low- and moderate-income families. A later section of this paper will examine some current Fannie Mae activities in this area.

IV. How Do We Define "Housing for Low- and Moderate-Income Families?"

In order to judge whether Fannie Mae buys a "reasonable" number of mortgages which are "related to the national goal of providing adequate housing for low- and moderate-income families," we need to know who those families are, or what housing is presumed to be "for" such families. There is no universally accepted definition of "low- and moderate-income families," and several definitions might be used. Establishing an upper limit for "moderate-income families" also will establish an upper limit for "low- and moderate-income families," so this section will devote more time discussing moderate income than low income.

A fairly obvious observation is that lower income families are less likely to be homeowners than higher income families. Median income for renter families was $15,546 in 1982, compared to a median income of $26,798 for homeowning families. One should not conclude that homeownership is rare among the poor, however. Almost 47 percent of the households classified as "very low income" (less than 50 percent of area median incomes) by HUD were homeowners in 1978.[7] Still, many of these households consisted of retired persons, and the representation of very low-income families in the market for buying homes is fairly limited. Buying a first home requires the accumulation of funds for the downpayment as well as sufficient income to manage monthly mortgage payments. These requirements put homeownership beyond the reach of

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[7]See the 1982 National Housing Production Report, U.S. Dept. of HUD, Office of Policy Development and Research, Washington, 1983.

many low-income families. Accordingly, programs related to multifamily rental housing will be important in assessing the extent to which FNMA assists low-income families.

In discussing "moderate income" it is useful to consider what is meant by "moderate." The term "moderate" has several meanings, of which two are important here. Does moderate mean average income or housing, or does it mean modest? Without becoming overly semantic, we may note that a range of definitions is possible, stretching from the mean or median of the distribution to a point somewhat below, and perhaps not closely related to the distribution at all. An example of the latter type of definition would be the official poverty lines, which are adjusted for changes in prices, but not for changes in the income distribution. It should be noted that Fannie Mae has implicitly appealed to the notion of using the mean of the distribution in establishing the extent to which it serves low- and moderate-income families.[8] In the Section 8 housing program, HUD uses 80% of area median income as "low income" and 50% of area median income as "very low income." It is interesting to note that on a national basis, median income for renter families is about 66 percent of the median income for all families. This implies that most renter families are considered "low income," although this is based on overall averages, and may not apply to particular areas within the U.S. As cited above, for the purpose of the Fannie Mae regulations, HUD chose to define housing rather than families, and first proposed to define "housing for low- and moderate-income families" as median home sales prices for each area. Later, this was changed to a lower point in the distribution--2.5 times area median family income.

The "2.5 times median income" criterion was adopted after HUD received comments that median home prices were not available for all areas on a regular basis. HUD compiles median incomes for SMSA's and counties, and this became the basis for the criterion. It should be noted that the median prices for single family dwellings in an area will tend to be higher than the median priced house purchased by the family of median income. In spite of this observation, suppose we make the presumption that the median-income family is expected to be able to buy a home if the home price does not exceed 2.5 times the family's income. Assume that a typical home is financed with a mortgage equal to 80 percent of the selling price, and that a family may devote at most 20 percent of its income for interest on a mortgage. Ignoring downpayments, closing costs, and monthly payments for principal, taxes, insurance, and maintenance, we note that 20 percent of median income equals 80 percent of the home value times the interest rate. That is, $.2Y = (.8H) \times i$, where Y equals the median family income, H

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[8]See pages 25-27, "The Benefits of Fannie Mae" (footnote 6).

equals the home price, and i equals the interest rate. If the home price is taken to be equal to 2.5 times median income, we may substitute H = 2.5Y and solve for the interest rate implied by this exercise, which turns out to be 10 percent, which is on the order of mortgage interest rates in 1978. Of course, other assumptions would yield somewhat different results, but it is at least plausible that the "2.5 times median family income" rule was based on the home that the median-income family was expected to be able to afford.

Changes in interest rates make this rule somewhat suspect, as will be shown. Suppose interest rates rise substantially. This will mean that the family will no longer be able to buy homes it could qualify for before the interest rate increase, and will move down in the price distribution to lower quality houses, or perhaps defer buying a home at that time. During such periods, mortgages issued will tend to be concentrated among higher income families, and the divergence between the home that the median-income family will be able to afford and the median-priced house will diverge. As might be expected, the share of FNMA purchases meeting the "2.5 rule" fell during 1979, a time of rising interest rates, as higher income families became more preponderant in the mortgage market.

We might ask whether the "2.5 times median income" rule was intended to be a proxy for median house prices in an area or an estimate of the price of a home that the median-income family could afford. As shown, it serves neither purpose very well. A requirement based on median family income would have to be adjusted for changes in interest rates if it is to represent the affordable home. The further actual interest rates diverge from 10 percent, the worse the criterion works.

We may also ask whether Fannie Mae ought to be required to take steps to ensure that 30 percent of conventional mortgages purchased be secured by houses selling for 2.5 times area median incomes or less, either annually or as a longer term goal. In times of high and rising interest rates, investors with portfolios of long term securities, such as Fannie Mae, are in a severe profit squeeze. Rising interest rates cause an implicit capital loss of the portfolio, or alternatively cause the spread between the shorter term borrowing interest rate and the longer term interest earned on the portfolio to become large and negative, leading to negative profits. The 30-percent goal is harder to meet in such times, and forcing the corporation to take additional steps to aid low- and moderate-income families during such episodes does not appear to be feasible. In normal times, the 30-percent goal is easier to meet, and in an era of falling interest rates, the goal would be easier yet to surpass. It can be concluded that the 30-percent rule conflicts with the requirement that aid to low- and moderate-income families in terms of mortgage purchases "provide a reasonable economic return to the corporation," unless the rule is not enforced on an annual basis.

V. The Relation of Fannie Mae's Major Programs to Low- and Moderate-Income Families

Fannie Mae's major programs, portfolio purchases and mortgage-backed securities (MBS), provide the greatest potential for providing benefits to low- and moderate-income families, regardless of which definition of such families is used. The sheer size of the FNMA portfolio ($85 billion) and the volume of MBS ($40 billion) have had, and continue to have, a sizable impact on all segments of the mortgage market. As seen above, current HUD regulations refer only to conventional mortgages purchased for portfolio, other than defining certain FHA mortgages as being secured by "housing for low- and moderate-income families." MBS are not addressed in the regulations, nor were data provided on such securities, other than gross totals and some descriptive information. Because of these considerations, only a brief discussion of MBS will be presented here, and the major focus of this section will be FNMA portfolio purchases.

MBS have been a rapidly growing segment of the activities of Fannie Mae since they were introduced in 1981. FNMA guarantees timely payment of interest and principal on these securities, which are backed by conventional mortgages. Overall, from the point of view of this paper, the MBS may be viewed as a device to increase the liquidity of mortgages by pooling and standardizing investments, thereby increasing their attractiveness to investors. It is beyond the scope of this paper, and perhaps currently not feasible, to estimate the impact of each participant in the secondary mortgage market on overall mortgage interest rates.[9] When innovations occur, the spread in yields between certain mortgages and bonds of similar maturities may narrow, but it is difficult to attribute the narrowing to particular participants in the secondary market. Were there only one agency or corporation involved in the innovation, one might attribute the lower interest rates to that entity, but this begs the question of whether some other institution, or some other arrangement, might have served as well. The establishment and development of secondary mortgage markets has lowered overall borrowing costs to mortgagors, and eased the flow of funds geographically. Low- and moderate-income families, to the extent that they have been homebuyers, have participated in these benefits, including the benefits that have flowed from Fannie Mae secondary market activities.

In a similar vein, activities of Fannie Mae in making and supporting secondary markets via portfolio management have also led to the kind of benefits alluded to above. It is doubtless

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[9]Patric Hendershott and Kevin Villani, "Secondary Mortgage Markets and the Cost of Mortgage Funds," AREUEA Journal, vol. 8, no. 1.

true, but difficult to quantify, that the effects of Fannie Mae commitment and mortgage purchase activities have been beneficial to homebuyers, including those of lower incomes. Also, to the extent that Fannie Mae buys multi-family mortgages (discussed in the next section), lower income families may be said to benefit indirectly, through the provision of rental housing that otherwise might not have been brought into the housing market. In order to be more specific about quantifiable impacts of Fannie Mae activities on low- and moderate-income families, we will look at actual portfolio purchases of single-family mortgages.

Data from Fannie Mae show that mortgages purchased by the corporation are on average smaller than the average of mortgages for the entire market. Since 1975, Fannie Mae-purchased mortgages have averaged in value about 83 percent of overall mortgages closed, for one-family homes. Table 1 shows that the ratio has been variable, and while the ratio has been higher in the last two years shown, one can't conclude that this is a departure from previous years. Fannie Mae-purchased mortgages tend to have higher loan-to-value ratios than the typical mortgage, so the mean of the distribution of home prices represented by Fannie Mae mortgages, stated as a percentage of all home prices, is lower than the ratio of mortgage amounts. Over the period 1975 to 1983, Fannie Mae home prices were about 74 percent of the national averages, although there may be a slight trend toward an increased ratio over time.

One may ask the question of how the conforming limit ($114,000 for a one-family unit in 1984) affects the average size of mortgages purchased by Fannie Mae. Data for the first nine months of 1984, provided by the Federal Home Loan Bank Board,[10] show that the average one-family fully amortized mortgage amount was $64,500, and the average corresponding home purchase price was $86,500. Excluding non-conforming loans from the calculation, the average one-family fully amortized mortgage amount was $55,200 and the average corresponding purchase price was $74,700. In other words, excluding the non-conforming loans lowered the average mortgage amount by about $9300 (a drop of 14.4 percent), and lowered the average purchase price by about $11,800 (a drop of 13.6 percent). If the same relationships applied in 1983,[11] then

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[10] Fannie Mae data are from "The Benefits of Fannie Mae," (footnote 6 above). Federal Home Loan Bank Board data refer to fully amortized mortgage loans closed during the first five business days of each month.

[11] Loans were not shown for 1983 according to whether they met the conforming limit for that year ($108,300), so the comparison here is a bit indirect.

Table 1

FANNIE MAE MORTGAGES PURCHASED AND AVERAGE HOME SALES PRICES, BY YEAR, 1975 TO 1983

Year	Fannie Mae Weighted Average Mortgage Amount*	As a Percentage of National Average Mortgage Amount	Fannie Mae Average Home Sales Price	As a Percentage of National Average Price
1975	$ 23,000	79	$ 26,210	67
1976	27,710	87	33,386	77
1977	29,970	82	35,259	73
1978	34,830	82	40,976	72
1979	40,040	83	48,829	75
1980	43,740	81	54,000	73
1981	45,820	80	57,275	72
1982	51,190	87	63,988	79
1983	52,950	85	66,188	79

Source: "Serving the Nation's Homebuyers, Housing Industry, and Housing Finance System: The Benefits of Fannie Mae," Fannie Mae, December 1984.

*Note: The Fannie Mae weighted average mortgage amount is calculated by dividing the average "single-family" (one- to four-family) average by 1.15, to adjust for 2- to 4-family mortgages included, as well as the lower per unit cost for 2- to 4-family dwellings. National averages are calculated for one-family dwellings only.

nearly all of the disparity between the average one-family mortgage purchased by Fannie Mae and the national average mortgage was accounted for by the conforming limit. Average prices for homes purchased with Fannie Mae-held mortgages remained below the national average, due to the fact that Fannie Mae mortgages have higher loan-to-value ratios than the national average. Still, most of the disparity in prices is apparently due to the effect of the conforming limit. It appears that Fannie Mae does not go out of its way to purchase low-denomination mortgages, the interpretation of which depends on whether Fannie Mae should continue to accept for purchase mortgages that are brought to the corporation, or whether the corporation should change its fundamental methods of operation.

Depending on the definition of "housing for low- and moderate-income families," the average conventional mortgage purchased may or may not be an appropriate measure of achievement in serving such families. Accordingly, data on the distribution of mortgage purchases will be examined for the first 9 months of 1984. It should be noted at the outset that the Fannie Mae distribution represents the unadjusted "single family" (that is, one- to four-family) mortgages, while the national data refer to one-family housing only. In converting its overall portfolio of

single family mortgages to equivalent one-family mortgages, Fannie Mae has used a rule of thumb of 1.2--on the average, each single-family mortgage represented 1.2 units. (This factor was reduced to 1.15 in the data used in Table 1 to adjust for the lower per unit costs of two- to four-unit dwellings.) The rule of thumb is based on FNMA experience, but apparently not an enumeration of the FNMA portfolio. Adjusting the average mortgage amount by this factor may be appropriate, but it is not appropriate when viewing the distribution of mortgages, since smaller mortgages are much more likely to represent one-family units than larger mortgages. In the absence of data, it will be assumed that FNMA mortgages with denominations less that $60,000 are one-family loans, so that the lower part of the distribution will be comparable to the national average distribution of one-family mortgages closed. The upper part of the distribution will contain most of the two- to four-family mortgages, but some inferences can be made even though the distributions are not quite comparable. Actual data on FNMA one-family mortgages would be preferable to the approximation here, but the data were not available.

Table 2

FANNIE MAE SINGLE-FAMILY MORTGAGE PURCHASES AND FHLBB REPORTED MORTGAGES CLOSED, FIRST 9 MONTHS, 1984, PERCENTAGE DISTRIBUTIONS

	FNMA single-family mortgages purchased	FHLBB reported fully amortized mortgages closed
Less than $40,000	23.8%	26.9%
40,000 - 59,999	34.8	27.9
60,000 - 79,999	22.7	19.1
80,000 - 99,999	10.6	10.2
$100,000 and over	8.1	15.8

Sources: "The Benefits of Fannie Mae," Fannie Mae, December 1984; and data provided by the Federal Home Loan Bank Board.

Data in table 2 must be interpreted with great care. The existence of two- to four-family mortgages in the upper ranges of the distribution gives a different distribution from that we should have if such mortgages were excluded. If about 10 percent of the mortgages are for these two- to four-family units, and if all such units are in the above $60,000 range, excluding such

units will raise the percentages in the FNMA column from 23.8 to 26.4 and from 34.8 to 38.7 (ignoring the adjustments in the rest of the column). This adjustment would indicate that FNMA buys about the same percentage of below $40,000 one-family mortgages as are originated in the whole market. One should remember, however, that the FHLBB total includes non-conforming loans. If non-conforming loans are excluded from the FHLBB total, the percentage in the less than $40,000 category grows to 29.9 percent, noticeably above the adjusted Fannie Mae percentage for these mortgages.

With or without these adjustments, the FNMA percentage in the $40,000 to $60,000 category is considerably above the national average. If we were to speculate that loans in the $40,000 and under category are more likely to be for "low-income families" and that loans in the $40,000 to $60,000 category are more likely to be for "moderate income families" then it would appear that Fannie Mae is being more successful at serving those of moderate income than those of low income. Perhaps, mortgage originators find it less profitable to sell the smaller denomination loans to Fannie Mae, so that this is a result of forces within the market rather than any conscious attempt by Fannie Mae to serve various parts of the market disproportionately.

VI. Special Fannie Mae Programs for Low- and Moderate-Income Families[12]

Fannie Mae is currently engaged in a number of "special" programs that may be said to be targeted to low- and moderate-income families. Most of these programs are quite small, relative to the major programs discussed above, and as such the programs do not seem to have a substantial impact on lower income housing on a national basis. Some of the programs may be experimental or pilot programs, and some may by their nature have a limited impact. The programs fall into three categories: those programs which affect low- and moderate-income families in relatively few locations; programs that are planned, but not fully implemented; and programs that have the potential for a larger impact on low- and moderate-income families.

In the first group, Fannie Mae has entered into municipal tri-party participation plans for providing lower cost housing, and providing a total of $50 million in home financing in five U.S. cities, of which Fannie Mae provides a major share. Another program has provided a $100 million commitment to the National Association of Real Estate Brokers (NAREB) to provide mortgages in 21 cities. NAREB is a predominantly minority organization, and the funds will in part provide low- and moderate-income housing

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[12]This section also relies heavily on "The Benefits of Fannie Mae" referred to in footnote 6 above.

finance. A third program involves a $25 million commitment to the National Housing Services of America (NHSA) to help support the rehabilitation of rental housing in low income areas. In addition to these programs, Fannie Mae has taken part in programs in Boston and Detroit to provide for rehabilitation of single- and multi-family housing.

Programs that are planned included an announcement by Fannie Mae that it will purchase loans where mortgage credit certificates (an alternative to mortgage subsidy bonds) are used, beginning this year (1985). Fannie Mae is also working with HUD to provide financing for homes built under the new Affordable Housing Program.

In the third category of programs, Fannie Mae engages in several activities that have a greater potential to have an impact on housing opportunities. Fannie Mae's credit enhancement programs have aided in the financing of $850 million of mortgage revenue bonds, which generally support the financing of housing for low- and moderate-income households. Fannie Mae also purchases multi-family mortgages, and estimates that this activity finances the development or rehabilitation of 100,000 units annually. Finally, Fannie Mae makes commitments to purchase loans for manufactured housing and the new FHA-insured ARM program. Manufactured housing is an important source of housing for low income families, and FHA mortgages tend to appeal to low- and moderate-income families. It should be noted that FNMA purchases of FHA and VA loans have fallen to a small fraction of total activities, probably due in part to the development of mortgage backed securities, which have become more attractive vehicles for the sale of such mortgages than sale to FNMA.

Overall, in developing new ways to support secondary markets for housing, particularly in the submarkets that offer opportunities to lower income families, Fannie Mae has provided some support. Some of the programs discussed in this section are too small to have a significant impact on such families, but overall the existence of the programs indicates a degree of support. It is not possible to quantify the magnitude of this support, but one may conclude that it is of a smaller order of magnitude than the major programs discussed earlier in the paper. While one should not ignore these programs, their existence is probably not of sufficient magnitude to tip the scales one way or the other regarding whether Fannie Mae does "enough" to help low- and moderate-income families.

VII. Conclusions

This paper has explored legislation, regulations, definitions, and evidence regarding the relationship of Fannie Mae to low- and moderate-income families. If we accept a definition

of "moderate-income housing" that includes homes near the national mean sales price and below, then Fannie Mae devotes a major part of its mortgage purchases to such housing. As was shown in this paper, the primary reason for this appears to be the conforming limit. The average loan origination, exclusive of non-conforming loans, is very close to the average loan Fannie Mae purchases. In looking at the distribution of loans purchased by Fannie Mae, one sees a larger than average percentage for $40,000 to $60,000 loans, but probably a lower than average percentage for loans under $40,000, compared to the national average. One may interpret this to mean that the lowest income homebuyers are receiving less help from Fannie Mae than are "moderate-income" homebuyers, but an alternative interpretation is that such loans are less likely to be traded in secondary markets than are loans of larger denomination.

HUD regulations were examined for their effects on Fannie Mae purchases of loans for "low- and moderate-income families" and found to be ineffective in times of low interest rates and unattainable in times of high interest rates. In fact, any regulation establishing quotas may be in serious conflict with Fannie Mae's prime directive--to maintain secondary markets in mortgages. As an alternative, expansion of some of Fannie Mae's "special programs" might be a better vehicle for serving low-income families. The objective of serving moderate-income families seems to be better attained, largely due to the effects of the conforming limit. (Of course, this assessment depends on one's definition of "moderate income.")

§ 81.17 Conventional mortgage purchases related to housing for low- and moderate-income families.

(a) Section 302(b)(2) of the Charter Act authorizes FNMA, with the approval of the Secretary, pursuant to commitments or otherwise, to purchase, service, sell, lend on the security of, or otherwise deal in conventional mortgages, for the purposes set forth in section 301(a) of the Charter Act. Section 309(h) of the Charter Act authorizes the Secretary to require that a reasonable portion of the corporation's mortgage purchases be related to the national goal of providing adequate housing for low- and moderate-income families, but with reasonable economic return to the corporation.

(b)(1) Beginning on March 1, 1979 and annually thereafter, whenever in the preceding calendar year FNMA's purchases of conventional mortgages secured by housing for low- and moderate-income families, as defined in paragraph (1) of § 81.2 is less than 30 percent of the corporation's aggregate number of purchases of such mortgages for the period, the Secretary may establish an annual goal for FNMA's purchases of conventional mortgages secured by housing for low- and moderate-income families.

(2) In establishing the annual goal with respect to FNMA's purchases of conventional mortgages secured by housing for low- and moderate-income families the Secretary shall consider: (i) The total number of such purchases of conventional mortgages by FNMA in the calendar year immediately preceding; (ii) the ratio of the number of conventional mortgages secured by housing for low- and moderate-income families purchased by FNMA in the calendar year immediately preceding to the total number of conventional mortgages purchased by FNMA in that period; (iii) the relationship of the average sales price of conventionally financed homes in the various sections of the United States to the median income of families in these sections of the United States; (iv) the condition of the housing market; and (v) general economic factors.

(c)(1) In any year for which the Secretary has established and published an annual goal for the purchase of conventional mortgages secured by housing for low- and moderate-income families, the Secretary shall, whenever she determines that FNMA's regular reports covering its secondary market operations for the first two quarters of that year reveal that FNMA's purchases of conventional mortgages secured by housing for low- and moderate-income families will fall below the annual goal established pursuant to paragraph (b)(1) of this section, require FNMA to provide, within 30 workdays, after her determination is made and communicated to FNMA, a plan of special actions proposed to be taken by it to increase its purchases of conventional mortgages secured by housing for low- and moderate-income families, or a statement of reasons why the annual goal should be altered or suspended.

(2) Within 15 days after receipt of the FMNA plan of special actions proposed to be taken by it to increase its purchases of conventional mortgages secured by housing for low- and moderate-income families, or FNMA's statement of reasons why the annual goal for such purchases should be altered or suspended, the Secretary shall approve, reject, or seek modification of the FMNA plan of special actions proposed, or approve or reject its proposed alteration or suspension of the annual goal for the year. If the Secretary decides to retain the goal announced for the year, or rejects the special actions proposed by FNMA to increase its purchases of conventional mortgages secured by housing for low- and moderate-income families, the Secretary may: (i) Require FNMA to conduct a separate auction, or auctions, of commitments to purchase conventional mortgages secured by housing for low- and moderate-income families, or (ii) require FNMA to hold open an offer to purchase newly originated conventional mortgages secured by housing for low- and moderate-income families, or (iii) condition the approval of any increase in obligational authority upon use of a designated amount of increased obligational authority for the purchase of conventional mortgages secured by housing for low- and moderate-income families. FNMA shall not be required to auction commitments to purchase conventional mortgages, or to purchase conventional mortgages, which: (a) Fail to meet FNMA's underwriting standards applicable to such mortgages, or (b) which are not deemed by the corporation to be of such quality, type, and class as to meet, generally, the purchase standards imposed by private institutional mortgage investors, or (c) which cannot be purchased within the range of market prices for the particular class of mortgages involved, as determined by the corporation.

(d) If in any calendar year the programs authorized to be conducted under paragraph (c)(2) of this section are implemented by FNMA and FNMA is nevertheless unable to accomplish the purchase of conventional mortgages secured by housing for low- and moderate-income families in such numbers as will enable it to meet the annual goal announced by the Secretary pursuant to paragraph (b)(1) of this section, the requirements of paragraph (b)(1) of this section shall be deemed satisfied for that calendar year.

ITEM 11—INTEREST OF MANAGEMENT AND OTHERS IN CERTAIN TRANSACTIONS

(a) Describe briefly any transactions since the beginning of the last calendar year or any presently proposed transactions, to which FNMA or any of its subsidiaries was or is to be a party, in which any of the following persons had or is to have a direct or indirect material interest, naming such person and stating his or her relationship to FNMA, the nature of his or her interest in the transaction and, where practicable, the amount of such interest:

(1) Any director or officer of FNMA;

(2) Any relative or spouse of any of the foregoing persons, or any relative of such spouse, who has the same home as such person who is a director or officer of FNMA.

It should be noted that this item calls for disclosure of indirect, as well as direct material interests in transactions.

A person who has a position or relationship with a firm, corporation, or other entity, which engages in a transaction with FNMA or its subsidiaries may have an indirect interest in such transaction by reason of such position or relationship. A person who is a director, executive officer, partner, limited partner, trustee or fiduciary for or the holder of more than two percent of any class of ownership indicia in any such firm, corporation or entity shall be deemed to have a material interest in any transactions with FNMA.

(b) State as to each of the following persons who was indebted to FNMA or its subsidiaries at any time since the beginning of the last calendar year of FNMA, (i) the largest aggregate amount of indebtness outstanding at any time during such period, (ii) the nature of the indebtedness and of the transaction in which it was incurred, (iii) the amount thereof outstanding as of the latest practicable date, and (iv) the rate of interest paid or charged thereon:

(1) Each director or officer of FNMA; and

(2) Each associate of any such director or officer.

This subparagraph does not apply to any person whose indebtedness was incurred in the regular course of FNMA's business.

(c) Describe briefly any transactions since the beginning of FNMA's last calendar year or any presently proposed transaction, to which any pension, retirement, savings or similar plan provided by FNMA or any of its parents or subsidiaries, was or is to be a party, in which any of the following persons had or is to have a direct or indirect material interest, naming such person and stating his or her relationship to FNMA, the nature of his or her interest in the transaction and, where practicable, the amount of such interest:

(1) Any director or officer of FNMA;

(2) Any relative or spouse of any of the foregoing persons, or any relative of such spouse, who has the same home as such person who is a director or officer of FNMA; or

(3) FNMA or any of its subsidiaries.

No information need be given in answer to subparagraph (c) with respect to payments to the plan or payments to beneficiaries, pursuant to the terms of the plan or to any interest of FNMA or any of its subsidiaries which arises solely from its general interest in the success of the plan.

APPENDIX C—REGULAR REPORTS

Pursuant to 24 CFR 81.23, FNMA shall submit certain regular reports to the Secretary. All dollar figures shall be in millions of dollars, unless otherwise specified.

1. AUCTIONS OF COMMITMENTS TO PURCHASE LOANS

Provide the results of each Free Market System auction of commitments to purchase home mortgage loans, including the status of obligational authority using the following form:

RESULTS OF FREE MARKET SYSTEM AUCTIONS

	Received			Accepted		
	FHA-VA loans	Conventional loans	Total loans	FHA-VA loans	Conventional loans	Total loans
(a) Date of auction						
(b) Number of offers						
(c) Dollar value of offers						
(d) Number of competitive offers						
(e) Number of noncompetitive offers						
(f) Dollar value of noncompetitive offers						
(g) Highest yield on offers						
(h) Lowest yield on offers						
(i) Average yield on offers						
(j) Median yield on offers						

RESULTS OF FREE MARKET SYSTEM AUCTIONS—Continued

	Received			Accepted		
	FHA-VA loans	Conventional loans	Total loans	FHA-VA loans	Conventional loans	Total loans
(k) Total value offered by mortgage companies						
(l) Total value offered by mutual savings banks						
(m) Total value offered by savings and loan associations						
(n) Total value offered by other lender groups						
(o) Total value offered by all lender groups						
(p) Number of offers from sellers who made two or more offers						
(q) Number of such sellers who made two or more offers						
(r) Dollar value of offers from sellers who made two or more offers						

RESULTS OF FREE MARKET SYSTEM AUCTIONS

STATUS OF OBLIGATIONAL AUTHORITY

(a) Total obligation authority.
(b) Per (date of latest authorization).
(c) Obligational authority committed.
(d) Obligational authority available.
(e) Expected mortgage repayments over next calendar month.
(f) Commitments outstanding.
(g) Expected run off of commitments over next calendar month.
(h) New commitments expected to be accepted during next calendar month.

2. STANDBY COMMITMENTS

Provide a tabulation of convertible standby commitments issued during the month for home and project mortgage loans, including the following data with separate figures for (a) FHA insured-VA guaranteed home loans (b) conventional home loans and (c) FHA insured project loans):

(a) Month, year.
(b) Number of commitments issued.
(c) Dollar value of commitments issued.
(d) Highest yield required.
(e) Lowest yield required.
(f) Average yield.
(g) Median yield required.

3. INVESTORS PURCHASING FNMA SECURITY ISSUES

Provide a tabulation showing which investor groups purchased the securities issued by FNMA during the quarter. For the report filed following the last annual quarter, this information shall be provided on a cumulative basis for all securities issued.

Separate figures should be shown for purchases of long-term securities (greater than six month maturity) and short-term securities as well as total securities purchased by each of the following investor groups:

(a) Commercial banks (excluding trust departments).
(b) Mutual savings banks.
(c) Savings and loan associations.
(d) Life insurance companies.
(e) State and local government retirement funds.
(f) State and local governments.
(g) Private, non-insured pension funds.
(h) Credit unions.
(i) Bank administered personal trusts and estates.
(j) Fire and casualty insurance companies.
(k) Non-financial corporations.
(l) Individuals and others.
(m) Retained by members of selling group classified by the Federal Reserve Bank of New York as "Government Security Dealers".
(n) Retained by other members of selling group not so classified.

4. STATEMENT OF LOAN PORTFOLIO

Provide a statement of the FNMA loan portfolio, indicating both aggregate dollar amounts of mortgages and the number of mortgages, as of the end of each calendar quarter in the following categories:

(a) Quarter, year.
(b) VA guaranteed.
(c) Conventional.
(d) FHA Section 203.
(e) FHA Section 221 (d)(2).
(f) FHA Section 235.
(g) Other FHA insured home loans.
(h) Total dollar amount and number of mortgages reported in (b)-(g).
(i) In central cities.
(j) In suburbs.
(k) In other areas.

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(i) FHA insured project mortgages (indicate number of dwelling units covered by each project mortgage).

NOTE: For each of the categories enumerated above indicate:

(1) Number of loans with one monthly debt service payment due at the end of the quarter.

(2) Number of loans with two monthly debt service payments due at the end of the quarter.

(3) Number of loans with three or more monthly debt service payments due at the end of the quarter.

(4) Number of loans assigned, repurchased, or foreclosed during the quarter.

5. CHARACTERISTICS OF CURRENT MORTGAGE PURCHASES

Provide a print-out of all mortgages purchased by FNMA during the quarter indicating the following:

(a) Geographic location by Standard Metropolitan Statistical Area (SMSA) or county if outside an SMSA location by census tract, (indicate for each property within an SMSA whether the location is in a central city or a suburb), (b) purchase price of home, (c) mortgage amount, (d) age of property, (e) income of owner-occupant, (f) median income of SMSA or non SMSA county in which property is located and (g) type of financing (FHA, VA or conventional loan).

Provide a summary of all mortgages purchased in the following categories:

(a) Central city.
(b) Suburban.
(c) Other.

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(d) FHA § 221.
(e) FHA § 235.
(f) FHA § 236.
(g) FHA § 237.
(h) Total number of units in housing projects defined in § 81.2(1)(3) which are not reported under clauses (d) or (f) above.
(i) Single family dwellings defined in § 81.2(1)(3) which are not reported under clauses (e) or (g) above.

NOTE: The information requested by clauses (a), (b), (c), and (i) should be presented separately for:

(1) Conventional home loans.
(2) VA guaranteed home loans.
(3) FHA § 203 loans.
(4) All other FHA insured home loans.

6. YIELDS ON LOANS PURCHASED

Provide a tabulation showing the average yield (gross of loan servicing) of (a) the home mortgage loans, and (b) project loans purchased during the quarter. If the loans were purchased via a GNMA Tandem Plan, the purchase price and yield should reflect the effective price at which the loans were purchased.

NOTE: The distribution by average yield should be provided separately (where applicable) for:

(a) Conventional loans.
(b) VA guaranteed loans.
(c) FHA Section 203 loans.
(d) All other FHA insured home loans.
(e) Total home loans.
(f) All FHA project loans.

7. SELLERS AND PURCHASERS OF MORTGAGE LOANS

Provide a tabulation by lender (group) of the dollar amount and number of loans purchased from and sold to during the quarter, with separate information for home mortgage loans and project loans. The lender groups include:

(a) Mortgage companies.
(b) Commercial banks.
(c) Mutual savings banks.
(d) Savings and loans associations.
(e) Government National Mortgage Association.
(f) All other financial institutions.
(g) Total institutions and agencies.

8. REVENUES, EXPENDITURES AND NET INCOME

Provide a tabulation of the revenues, expenditures and net income (measured in thousands of dollars) during the quarter, including the following:

I. REVENUES

(a) Quarter, year.
(b) Interest and discounts on home mortgage loans.
(c) Interest and discounts on project mortgage loans.
(d) Income from investments in securities.
(e) Commitment fees for home mortgage loans.
(f) Commitment fees for project mortgage loans.
(g) Capital gains on sales of mortgages.
(h) Compensation for services performed for Government National Mortgage Association.
(i) Foreclosure claims collected.
(j) Other income (explain in footnotes).
(k) Total revenues.

In addition, the quarterly report should also show a breakdown of the commitment fees, measured in thousands of dollars, as follows:

(a) Underwriting revenue fees.
(b) Offer fees for competitive Free Market System bids.
(c) Commitment fees for Free Market System offers accepted.
(d) Proceeding fees for Convertible Standby Commitment Offers.

(e) Commitment fees for Convertible Standby Commitment offers accepted.
(f) Commitment fees upon delivery of a non-converted Convertible Standby Commitment.
(g) Commitment fees upon receipt of a conversion of Convertible Standby Commitments.

II. EXPENDITURES

(a) Quarter, year.
(b) Interest cost on discount notes.
(c) Interest cost on all other debt securities.
(d) Capital losses on sales of mortgages.
(e) Loan servicing [illegible] servicers of home mortgage loans.
(f) Loan servicing [illegible] attributable to project mortgages.
(g) Actual losses sustained in the course of foreclosure actions.
(h) Provisions for possible future losses on mortgage portfolio (amounts credited to reserves for losses).
(i) Costs attributable to fiscal agent department and other costs associated with issuance of debt securities.
(j) Costs associated with sale or issuance of common stock.
(k) Payments to transfer agents and registrars for FNMA securities.
(l) Payments to independent public auditors.
(m) Payments for office space and equipment.
(n) Total salary payments to principal FNMA officers.
(o) Other salaries and expenses for FNMA staff.
(p) Total expenditures.

III. NET INCOME

(a) Quarter, year.
(b) Total revenues (line I (k)).
(c) Total expenditures (line II (p)).
(d) Net income (line b minus line c).
(e) Adjusted net income before taxes (adjustments for non-deductible items plus other adjustments, which should be explained in footnotes to table).
(f) Federal income taxes paid or payable.
(g) Transfers to retained earnings.
(h) Dividend payments.

9. COMMON STOCK

Provide a tabulation showing the distribution of the holdings of FNMA's outstanding common stock, as of the end of each calendar quarter, including the following:

(a) Quarter, year.
(b) Number of shares held by sellers of mortgage loans.
(c) Number of shares held by financial institutions.
(d) Number of shares held by individuals.
(e) Number of shares held by security dealers.
(f) Number of shares held by others.
(g) Total number of shares outstanding.
(h) Changes in number of shares outstanding (including date of change).
(i) Per share earnings, dividends.

Where information reported under this section as to the beneficial ownership of stock is unavailable to FNMA, it may be supplied by "street name" or nominee identifications. The basis for the computation of per share earnings shall also be set forth including the number of shares used in the computation.

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Comment On Richard B. Clemmer, "Fannie Mae And Its Relationship To Low- And Moderate-Income Families"

Cushing N. Dolbeare
Consultant On Housing Policy And Programs

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Richard Clemmer's paper provides, I believe, a useful review of FNMA's charter responsibilities, policies and activities for meeting the housing needs of low- and moderate-income families. Therefore, rather than critiquing his paper, I believe it will be more useful to try to take a fairly fresh look at the nature and extent of low- and moderate-income housing needs in this country, and then suggest some measures which FNMA should explore to meet them more effectively.

Much of the discussion at the symposium has been on whether, in fact, FNMA serves a public purpose and whether the exposure of the Federal Treasury is justified in terms of the benefits received. Because I believe that finding ways for the private sector to meet a greater share of low-income housing needs is an important social purpose, I believe that the relevant question is not whether or not FNMA should be privatized, but how to make sure that its activities do, in fact, serve a public purpose.

In short, finding ways to enhance the capacity of the private sector to provide decent, affordable housing should be considered a major responsibility of FNMA. At this time, and here I differ with Richard Clemmer's conclusions, I believe that FNMA can play a significant role--not so much in its secondary market activities as in developing and enhancing the use of financing instruments and approaches which would otherwise find little acceptability.

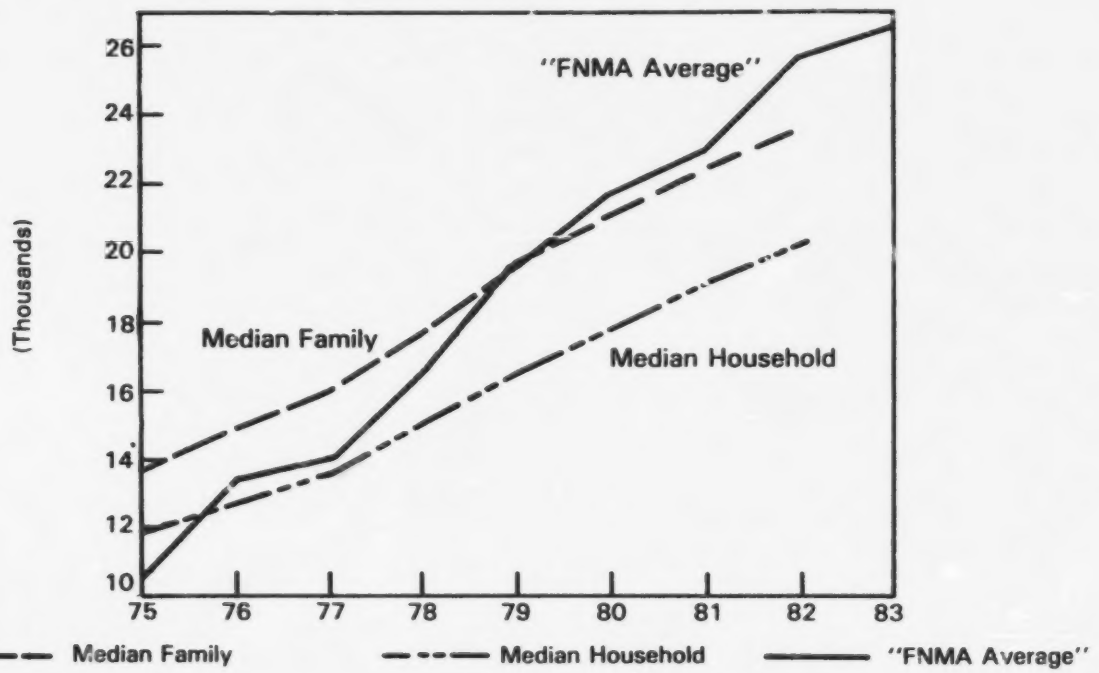
However, as Clemmer's paper indicates, for whatever reasons, FNMA appears to be shifting away from serving people with incomes below the median. Table I provides a calculation, based on figures in Clemmer's paper, which compares the FNMA average sales price and "FNMA average income" (average price divided by 2.5) with median household income and median family income for the years 1975-83. Chart I depicts this graphically, showing that the FNMA average income rose from 89% of median household income in 1975 to 127% in 1982.

All of my experience in housing, over more than three decades, leads me to believe that getting the private sector to serve low- and moderate-income families is a bit like making water run uphill: it can only be done if there is sufficient pressure behind it. To the extent that there is a federal responsibility for the activities of FNMA, therefore, the federal government should apply whatever pressures it can to see that FNMA gives major priority to finding ways of making housing more affordable. As Clemmer's paper notes, there are two major tools available which relate to this: the "conforming limit" and HUD's reporting requirements.

TABLE I. FNMA AVERAGE SALES PRICES COMPARED WITH MEDIAN INCOMES

Year	FNMA Average	% of Natl Av Price	"FNMA Income" (2.5 ratio)	Households Median Income	Households FNMA as % of med	Families Median Income	Families FNMA as % of med
1975	$26,210	67%	$10,484	$11,800	89%	$13,719	76.4%
1976	$33,386	77%	$13,354	$12,686	105%	$14,958	89.3%
1977	$35,259	73%	$14,104	$13,572	104%	$16,009	88.1%
1978	$40,976	72%	$16,390	$15,064	109%	$17,640	92.9%
1979	$48,629	75%	$19,532	$16,461	119%	$19,587	99.7%
1980	$54,000	73%	$21,600	$17,710	122%	$21,023	102.7%
1981	$57,275	72%	$22,910	$19,074	120%	$22,388	102.3%
1982	$63,988	79%	$25,595	$20,171	127%	$23,433	109.2%
1983	$66,188	79%	$26,475				

Chart I
FNMA Income Compared With National Medians
(FNMA = Average price/2.5)



- Under regulations adopted in 1978, HUD could establish an annual goal for FNMA purchases of conventional mortgages for low- and moderate-income families whenever such purchases fell below 30% annually. In 1982, HUD waived reporting requirements which would provide information on whether the 30% threshold was being met. The requirements should be reinstated.

- Clemmer concludes that, at least in 1983, "nearly all the disparity between the average one-family mortgage purchased by Fannie Mae and the national average mortgage was accounted for by the conforming limit" (p. 202-3). Yet, at present, the conforming limit is applied on a national basis, despite very large price variations among housing markets. A lower conforming limit, with exception provisions for high-cost areas, could be expected to push FNMA more heavily into the moderate-income market. Alternatively, the conforming limit might be calculated on an area basis, as an index of median home sales prices.

Definitions of Low and Moderate Income

As Clemmer's paper notes, there is a range of possible definitions of low and moderate income. HUD has adopted as its criterion for FNMA a sales price of 2.5 times median family income in the area. Criteria used for other housing programs are 80% of median (as defined by HUD with adjustments for household size)--the definition of "lower income" used in assisted housing and community development programs--and 50% of median (again, as defined by HUD)--the definition of "very low income" and the criterion for most admissions to assisted housing. Neither the official poverty level nor 125% of poverty have been used for housing, although they are commonly accepted measures of low income.

Table II contrasts these measures, using 1980 figures. Part A shows the income levels, by household size. Part B simply multiplies these figures by 2.5 to show the purchase price below which a unit would be considered, by FNMA, to be low/moderate income. In 1980, the average purchase price of homes financed through FNMA was $54,000. Since figures on the actual distribution of FNMA-financed homes are unavailable, Part C of the table shows the figures in Part B as percentages of the FNMA average home price of $54,000 in 1980. Chart II shows the erratic nature of these criteria: The HUD definition of 80% of median is higher than the actual median for single-person households, and the 50% of median measure, for large families, is lower than the 125% of poverty threshold, although for smaller households it is well above the poverty level.

TABLE II. ALTERNATIVE MEASURES OF LOW AND MODERATE INCOME AND "AFFORDABLE" HOUSING BY HOUSEHOLD SIZE, 1980

A. ANNUAL INCOME LEVELS

	One Person	Two Persons	Three Persons	Four Persons	Five Persons	Six Persons
Poverty	$4,190	$5,363	$6,565	$8,414	$9,966	$11,269
125% of poverty	$5,238	$6,704	$8,206	$10,518	$12,458	$14,086
Median household	$8,162	$17,506	$21,737	$24,410	$24,857	$24,415
80% of median	$6,530	$14,005	$17,390	$19,528	$19,886	$19,532
50% of median	$4,081	$8,753	$10,869	$12,205	$12,429	$12,208
Median family	--	$17,189	$21,626	$24,332	$24,843	$24,396
HUD 80% of median	$10,512	$13,455	$15,137	$16,818	$17,870	$18,921
HUD 50% of median	$6,307	$8,409	$9,460	$10,512	$11,352	$12,193

B. MAXIMUM "AFFORDABLE" PURCHASE PRICE LIMIT AT 2.5 TIMES ANNUAL INCOME LEVEL

	One Person	Two Persons	Three Persons	Four Persons	Five Persons	Six Persons
Poverty	$10,475	$13,408	$16,413	$21,035	$24,915	$28,173
125% of poverty	$13,095	$16,760	$20,515	$26,295	$31,145	$35,215
Median household	$20,405	$43,765	$54,343	$61,025	$62,143	$61,038
80% of median	$16,325	$35,013	$43,475	$48,820	$49,715	$48,830
50% of median	$10,203	$21,883	$27,173	$30,513	$31,073	$30,520
Median family	--	$42,973	$54,065	$60,830	$62,108	$60,990
HUD 80% of median	$26,280	$33,638	$37,843	$42,045	$44,675	$47,303
HUD 50% of median	$15,768	$21,023	$23,650	$26,280	$28,380	$30,483

C. "AFFORDABLE" PRICE AS PERCENT OF FNMA AVERAGE PRICE OF $54,000

	One Person	Two Persons	Three Persons	Four Persons	Five Persons	Six Persons
Poverty	19.4%	24.8%	30.4%	39.0%	46.1%	52.2%
125% of poverty	24.3%	31.0%	38.0%	48.7%	57.7%	65.2%
Median household	37.8%	81.0%	100.6%	113.0%	115.1%	113.0%
80% of median	30.2%	64.8%	80.5%	90.4%	92.1%	90.4%
50% of median	18.9%	40.5%	50.3%	56.5%	57.5%	56.5%
Median family	--	79.6%	100.1%	112.6%	115.0%	112.9%
HUD 80% of median	48.7%	62.3%	70.1%	77.9%	82.7%	87.6%
HUD 50% of median	29.2%	38.9%	43.8%	48.7%	52.6%	56.4%

Chart II
Measures of Low Income, 1980

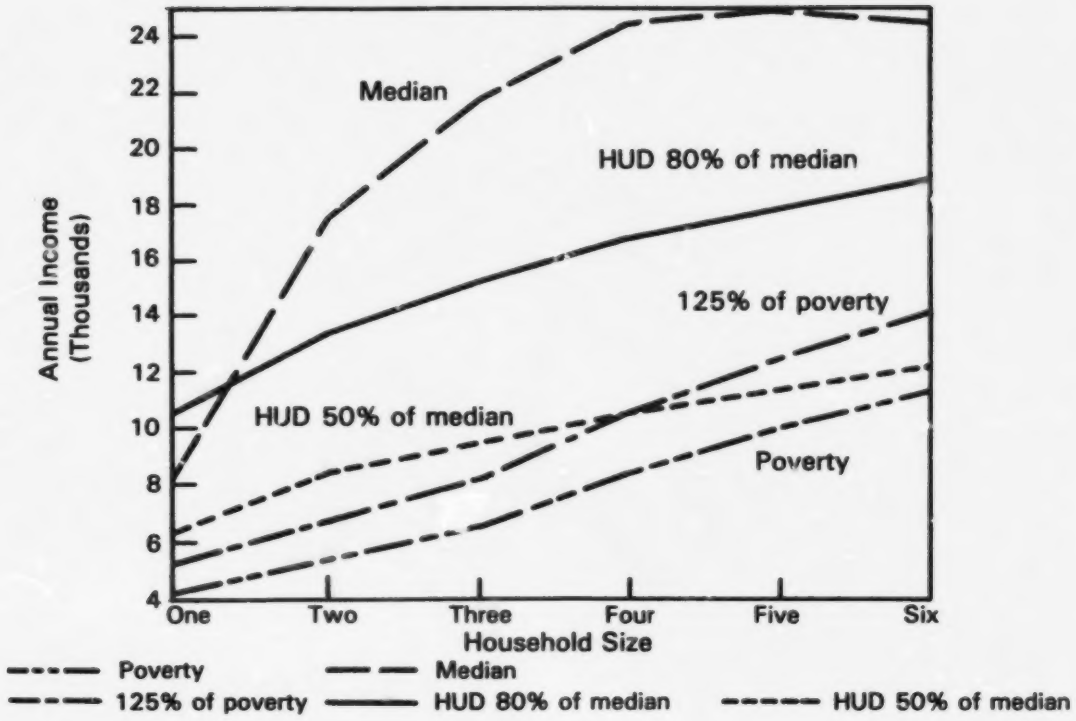


Chart III shows, as of 1980, the number of renter households with incomes below four of the thresholds just listed: the poverty level, 125% of poverty, 50% of median as defined by HUD and 80% of median as defined by HUD. It also shows that fewer than one fifth of these households now occupy subsidized housing. In 1981, President Reagan's Commission on Housing, in attempting to estimate the need for housing assistance, concluded that about one quarter of the 10 million renter households with incomes below 50% of median lived in assisted housing and that almost all the others were either in substandard housing or had high rent burdens, or both.

There is little controversy about the fact that housing needs are inversely correlated to income: the lower one's income, the higher the probability of living in substandard or unaffordable housing, or both. Although housing quality has been a traditional concern, millions of low-income households are living in housing which is not seriously substandard, but for which they pay very high proportions of their incomes. This is true both for renters

and for owners, whether or not they have mortgages. See Table III and Charts IV-IX, which show cost-income ratios for renters, mortgaged owners and unmortgaged owners by income class. The charts, using 1983 data, show both absolute numbers and percentages.

It should be evident from the foregoing that the low- and moderate-income threshold of sales price not in excess of 2.5 times median area income is a generous one. It does little to target assistance to those households with the greatest housing needs: those with incomes at or below 50% of median or, if a flat figure is more useful, households with incomes below $7,000.

Chart III
Low Income Renter Households
By Various Measures of Need, 1980

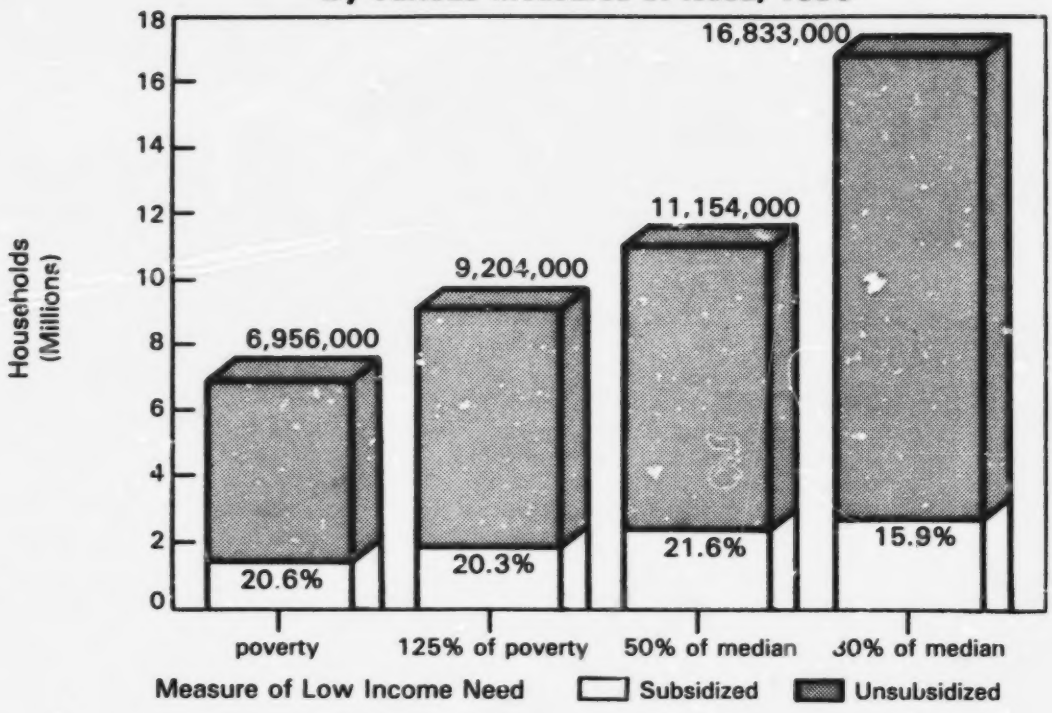


TABLE III. SHELTER COST-INCOME RATIOS, 1983
(Households in thousands)

United States Total	Total	Less than $3,000	$3,000 to $6,999	$7,000 to $9,999	$10,000 to $14,999	$15,000 to $19,999	$20,000 to $24,999	$25,000 to $34,999	$35,000 to $49,999	$50,000 to $74,999	$75,000 or more
RENTERS											
Households (thousands)											
Under 15%	4,094	19	92	94	220	389	460	1,175	1,051	434	162
15-30%	11,919	92	1,158	961	2,531	2,552	1,871	1,983	608	138	25
31-49%	6,745	118	1,459	1,366	2,183	965	398	210	37	10	0
50-59%	1,733	89	775	476	309	58	12	13	3	0	0
60% or more	5,425	1,991	2,688	479	210	44	7	7	0	0	0
Total	29,915	2,309	6,172	3,376	5,453	4,008	2,747	3,388	1,700	582	187
Percent distribution											
Under 15%	13.7	0.8	1.5	2.8	4.0	9.7	16.7	34.7	61.8	74.6	86.5
15-30%	39.8	4.0	18.8	28.5	46.4	63.7	68.1	58.5	35.8	23.8	13.5
31-49%	22.5	5.1	23.6	40.5	40.0	24.1	14.5	6.2	2.2	1.6	0.0
50-59%	5.8	3.9	12.6	14.1	5.7	1.4	0.4	0.4	0.2	0.0	0.0
60% or more	18.1	86.2	43.5	14.2	3.9	1.1	0.3	0.2	0.0	0.0	0.0
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MORTGAGED OWNERS											
Households (thousands)											
Under 15%	10,447	2	1	3	56	177	509	2,208	3,393	2,709	1,391
15-29%	15,506	15	27	183	945	1,721	2,214	4,786	3,602	1,559	455
30-49%	5,389	13	251	496	1,110	1,043	788	1,021	492	148	29
50-59%	829	8	170	170	242	100	57	54	24	3	3
60% or more	2,021	524	730	357	219	108	34	23	13	6	7
Total	34,192	561	1,180	1,208	2,573	3,148	3,602	8,091	7,525	4,424	1,885
Percent distribution											
Under 15%	30.6	0.3	0.1	0.2	2.2	5.6	14.1	27.3	45.1	61.2	73.8
15-29%	45.3	2.7	2.3	15.1	36.7	54.7	61.5	59.2	47.9	35.2	24.1
30-49%	15.8	2.3	21.3	41.0	43.1	33.1	21.9	12.6	6.5	3.3	1.5
50-59%	2.4	1.3	14.4	14.1	9.4	3.2	1.6	0.7	0.3	0.1	0.2
60% or more	5.9	93.3	61.9	29.5	8.5	3.4	0.9	0.3	0.2	0.1	0.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
UNMORTGAGED OWNERS											
Households (thousands)											
Under 15%	11,836	16	199	474	1,588	1,824	1,644	2,583	2,013	993	499
15-29%	5,217	23	1,269	1,360	1,524	604	270	138	24	6	0
30-49%	1,727	98	1,014	416	155	33	6	0	6	0	0
50-59%	281	27	202	44	6	0	0	3	0	0	0
60% or more	769	490	246	24	7	0	3	0	0	0	0
Total	19,830	656	2,929	2,318	3,280	2,461	1,922	2,724	2,043	999	499
Percent Distribution											
Under 15%	59.7	2.7	6.8	20.5	48.4	74.1	85.5	94.8	98.6	99.4	100.0
15-29%	26.3	3.5	43.3	58.7	46.5	24.5	14.0	5.1	1.2	0.6	0.0
30-49%	8.7	15.0	34.6	18.0	4.7	1.4	0.3	0.0	0.3	0.0	0.0
50-59%	1.4	4.1	6.9	1.9	0.2	0.0	0.0	0.1	0.0	0.0	0.0
60% or more	3.9	74.7	8.4	1.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Chart IV
Rent to Income Ratios, 1983
Households in Income Class

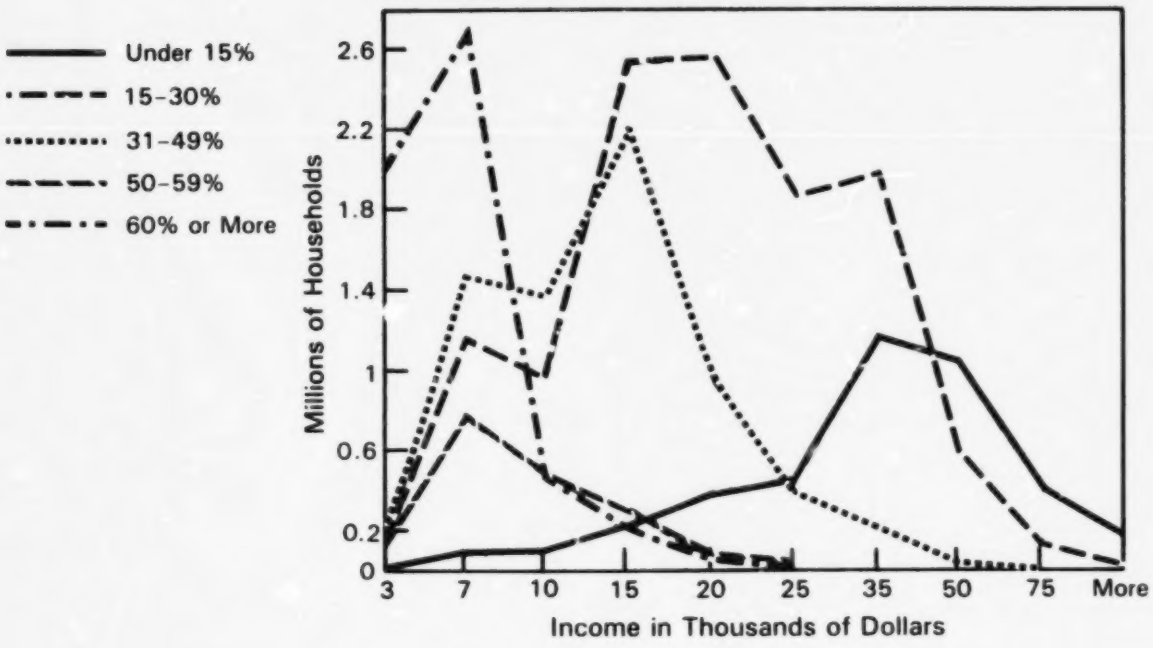


Chart V
Rent to Income Ratios, 1983
Percent of Households in Class

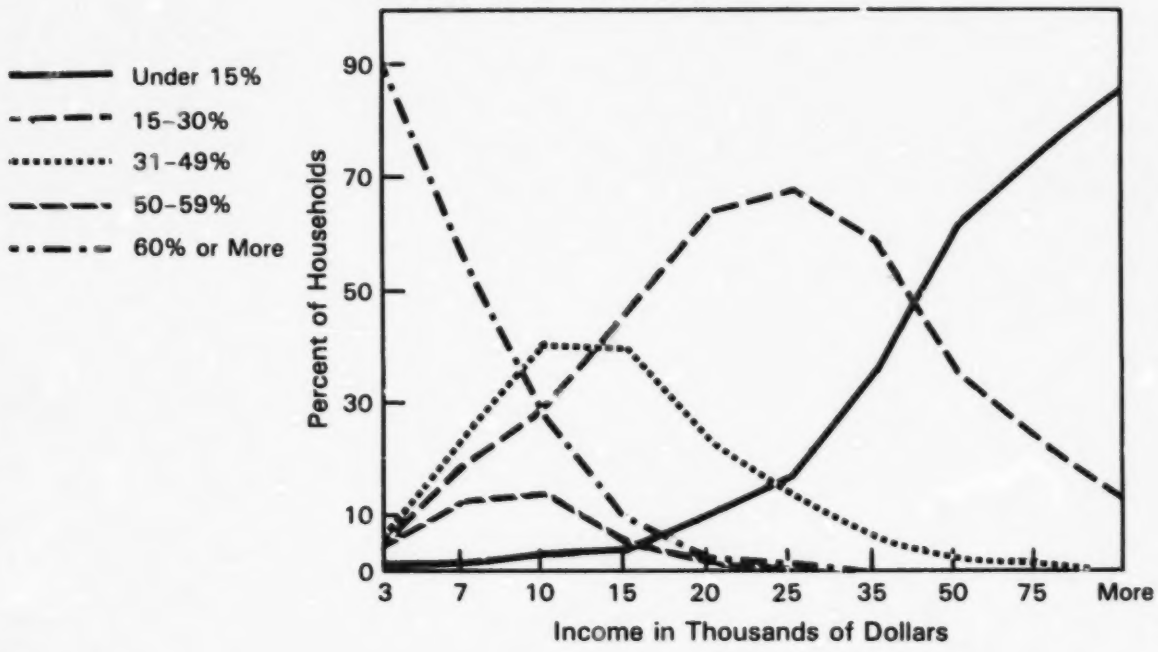


Chart VI
Cost to Income Ratios, 1983
Mortgaged Owner Households

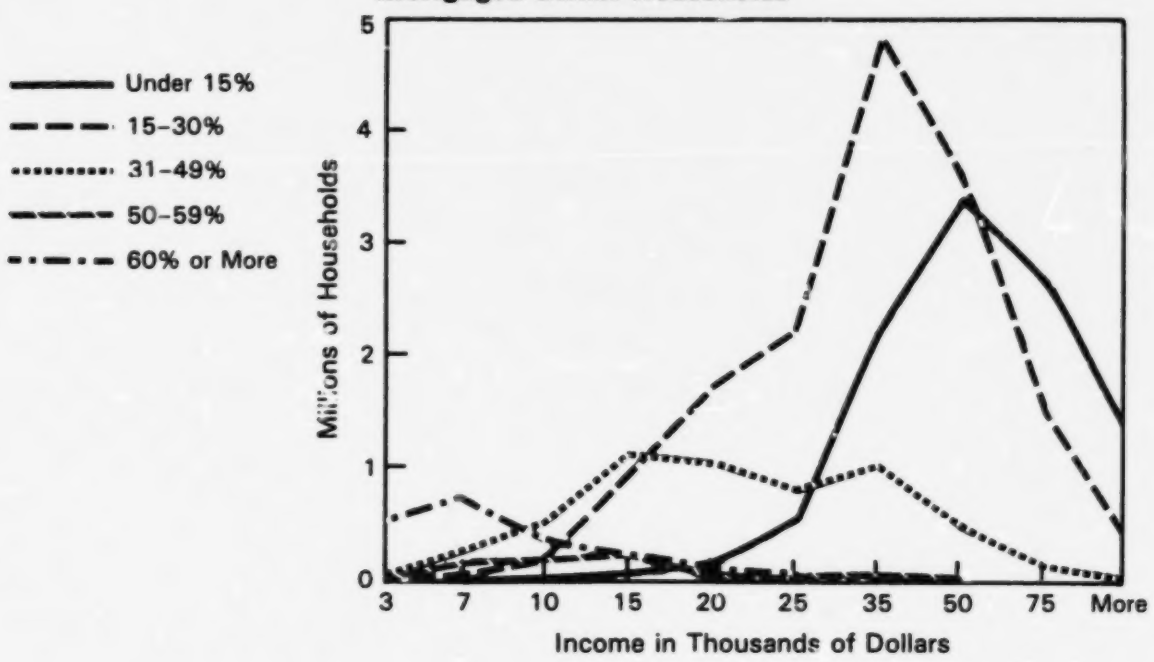


Chart VII
Cost to Income Ratios, 1983
Mortgaged Owner Households

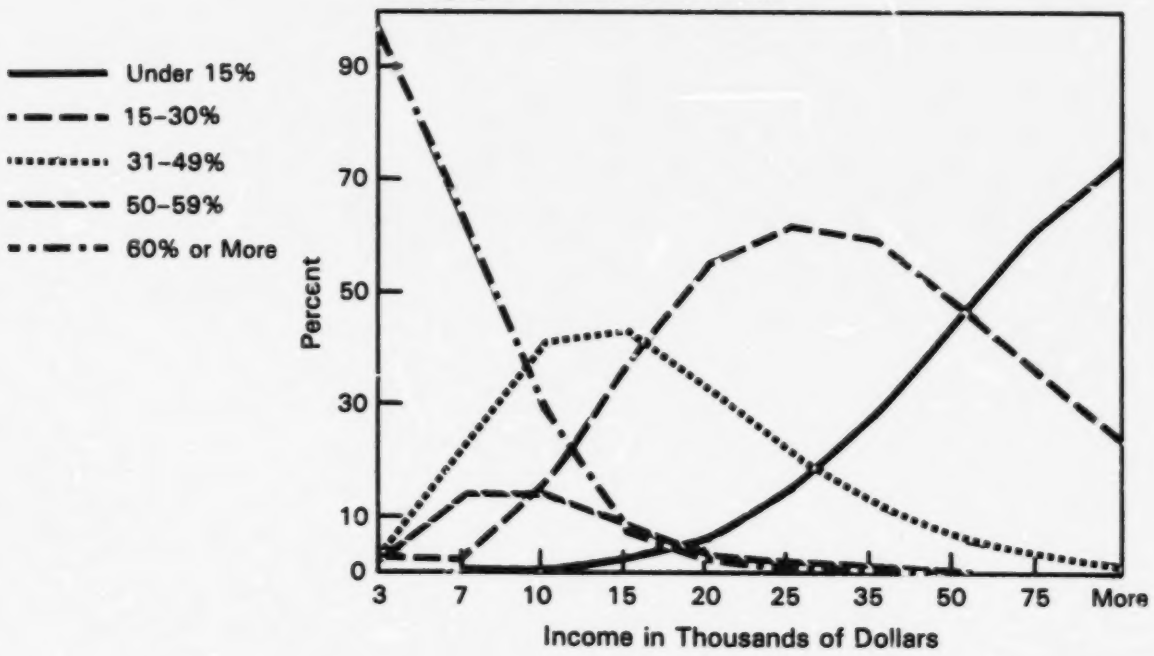


Chart VIII
Cost to Income Ratios, 1983
Unmortgaged Households

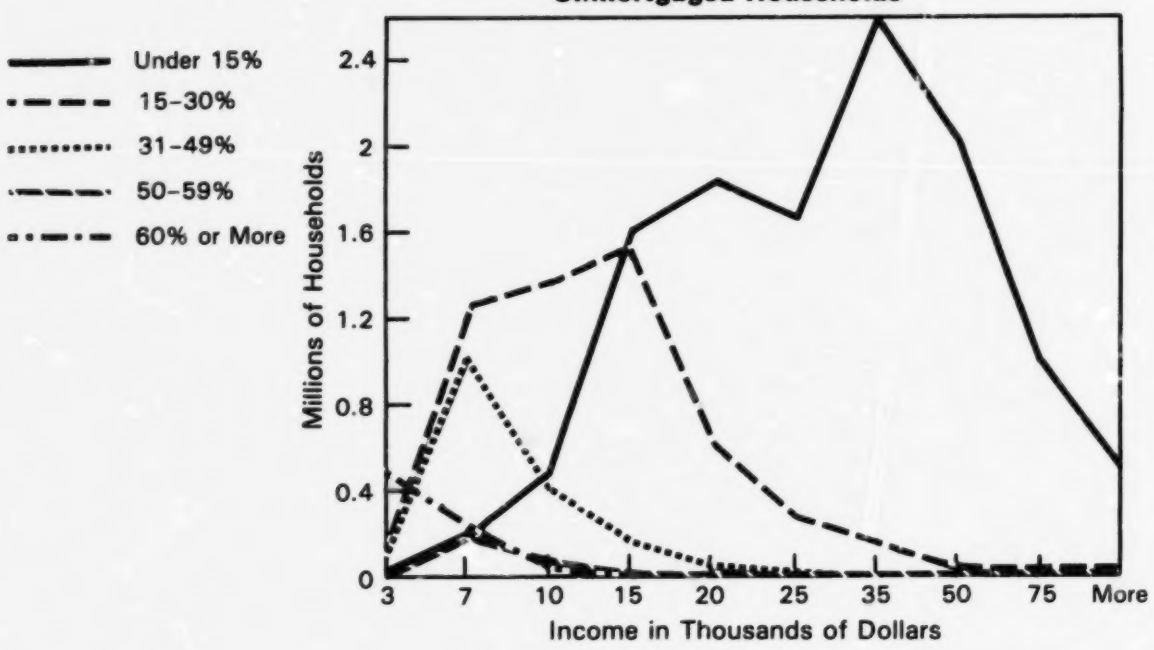
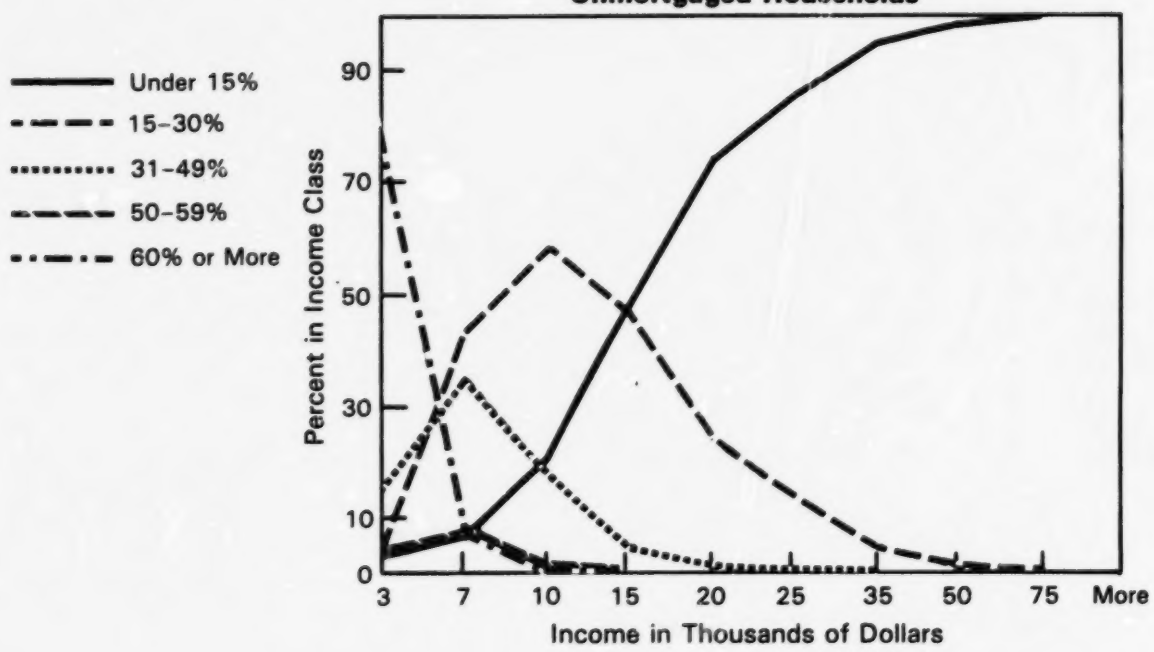


Chart IX
Cost to Income Ratios, 1983
Unmortgaged Households



However, it is equally clear that substantial subsidies are required to provide new or substantially rehabilitated units at affordable costs (25 or 30% of income) for households in this income bracket.

Therein lies the dilemma for FNMA. In the absence of federal subsidy programs, FNMA's capacity to serve low-income families at cost-income ratios of 25% or 30% is severely limited. Even here, however, there may be ways of providing low-income families with access to better housing than they could otherwise obtain. Since the vast majority of households with incomes below $7,000 now pay over 60% of their incomes for shelter, it would be reasonable to ask what FNMA could provide at cost-income ratios of 50% (still recognizing that this is an undesirable cost burden). After all, it is better to pay 50% of income for decent shelter than 60% or more for housing of inferior quality.

The major role of FNMA in serving low- and moderate-income households, however, in the absence of deep subsidy programs, will clearly be in assisting households with incomes somewhat above 50% of median. This is particularly true of FNMA's major activities of portfolio and mortgage-backed security purchases.

A major effort by FNMA to develop ways of penetrating lower in the income scale could, I believe, have significant results. In doing this, it would be desirable for FNMA, as a matter of policy, to look beyond broad income categories and seek to meet as many particular housing needs as it can. Segments of the market which merit special attention include: first time buyers, elderly homeowners, rental housing, housing for large families, and limited equity cooperatives. In each case, FNMA's capacity to serve households with incomes below 50% of median, from 50%-80%, and from 80%-100% should be analyzed separately.

In 1981, 21% of all owners and 43% of all renters had household incomes under $10,000. Another 25% of owners and 33% of renters had incomes between $10,000 and $20,000. In other words, 45% of all owners and 77% of all renters had incomes below $20,000. Forty percent of the owners with incomes below $20,000 were elderly; many would be candidates for repair or rehabilitation loans, or reverse annuity mortgages. Almost one third (32%) of the renters with incomes below $20,000 had one or more children under 18 in their households. One tenth of the renters with incomes below $20,000 and almost one quarter of those with incomes between $20,000 and $25,000 were married couples aged 25-29 years. These renter households are prime candidates for first-time home ownership (see Table IV).

TABLE IV. SELECTED CHARACTERISTICS FROM 1981 ANNUAL HOUSING SURVEY, BY INCOME
(Numbers in thousands)

	Total	Under $10,000	$10,000 to $20,000	Total Under $20,000	$20,000 to $24,999	$25,000 to $34,999	$35,000 to $49,999	$50,000 to $74,999	$75,000 or over	Median
Measures of "Affordability" (Monthly housing costs)										
25% of top of range	--	$208	$417	$417	$521	$729	$1,042	$1,562		
30% of top of range	--	$250	$500	$500	$625	$875	$1,250	$1,875		
35% of top of range	--	$292	$583	$583	$729	$1,021	$1,458	$2,187		
50% of top of range	--	$417	$833	$833	$1,042	$1,458	$2,083	$3,125		
Total households/units	83,175	23,812	23,110	46,922	9,367	12,737	8,687	3,907	1,555	
% of all households	100.0%	28.6%	27.8%	56.4%	11.3%	15.3%	10.4%	4.7%	1.9%	
Cumulative percent		28.6%	56.4%	56.4%	67.7%	83.0%	93.4%	98.1%	100.0%	
OWNERS	54,342	11,311	13,488	24,799	6,592	10,238	7,672	3,610	1,431	$21,800
Percent owners	65.3%	90.5%	58.4%	52.9%	70.4%	80.4%	88.3%	92.4%	92.0%	
Percent of all owners	100.0%	20.8%	24.8%	45.6%	12.1%	18.8%	14.1%	6.6%	2.6%	
Cumulative percent		20.8%	45.6%	45.6%	57.8%	76.6%	90.7%	97.4%	100.0%	
Mortgage Status - Owners										
Specified Owner-Occupied	43,293	8,081	10,146	18,227	5,351	8,686	6,668	3,152	1,209	$23,200
Units with mortgage	27,917	2,713	5,641	8,354	3,841	6,788	5,.97	2,591	947	$27,600
Units with no mortgage	15,376	5,368	4,505	9,873	1,510	1,898	1,271	561	262	$14,400
Percent unmortgaged	35.5%	66.4%	44.4%	54.2%	28.2%	21.9%	19.1%	17.8%	21.7%	
Elderly owners										
Married couples	6,508	2,050	2,593	4,643	612	616	381	168	87	$13,700
Other male householder	400	137	153	290	45	26	25	12	2	$13,500
Other female householder	1,008	463	332	795	62	81	55	15	0	$11,000
Subtotal, 2+ persons	7,916	2,650	3,078	5,728	719	723	461	195	89	
Single men	949	603	238	841	25	40	26	8	9	$7,800
Single women	3,522	2,675	643	3,318	84	66	33	19	3	$6,300
Subtotal, singles	4,471	3,278	881	4,159	109	106	59	27	12	
Total elderly	12,387	5,928	3,959	9,887	828	829	520	222	101	
Percent of all owners	22.8%	52.4%	29.4%	39.9%	12.6%	8.1%	6.8%	6.1%	7.1%	
% of all elderly owners	100.0%	47.9%	32.0%	79.8%	6.7%	6.7%	4.2%	1.8%	0.8%	
Cumulative percent		47.9%	79.8%	79.8%	86.5%	93.2%	97.4%	99.2%	100.0%	
RENTERS	28,833	12,501	9,622	22,123	2,775	2,499	1,015	297	124	$11,700
Percent renters	34.7%	52.5%	41.6%	47.1%	29.6%	19.6%	11.7%	7.6%	8.0%	
Percent of all renters	100.0%	43.4%	33.4%	76.7%	9.6%	8.7%	3.5%	1.0%	0.4%	
Cumulative percent		43.4%	76.7%	76.7%	86.4%	95.0%	98.5%	99.6%	100.0%	
With own children under 18	9,634	3,730	3,434	7,164	1,019	961	355	106	28	$12,700
% of all renters in class	33.4%	29.8%	35.7%	32.4%	36.7%	38.5%	35.0%	35.7%	22.6%	
% of renters with chldrn	100.0%	38.7%	35.6%	74.4%	10.6%	10.0%	3.7%	1.1%	0.3%	
Cumulative percent		38.7%	74.4%	74.4%	84.9%	94.9%	98.6%	99.7%	100.0%	
Married, no nonrelatives	10,822	2,708	4,123	6,831	1,497	1,525	686	198	85	$16,200
25 to 29 years	2,380	425	976	1,401	396	437	111	22	12	$17,700
30 to 34 years	1,701	296	712	1,008	246	272	119	39	15	$17,800
Subtotal, 25-34	4,081	721	1,688	2,409	642	709	230	61	27	
25-34 as % of all rtrs	14.2%	5.8%	17.5%	10.9%	23.1%	28.4%	22.7%	20.5%	21.8%	
% in income class	99.9%	17.7%	41.4%	59.0%	15.7%	17.4%	5.6%	1.5%	0.7%	
Cumulative percent		17.7%	59.0%	59.0%	74.8%	92.1%	97.8%	99.3%	99.9%	

In this connection, Clemmer's paper dismisses the role of FNMA's special and demonstration programs too casually. FNMA has provided the following preliminary information on its 1984 activities:

Tax exempt credit endowment	$954 million
Special commitments	125 million
Tri-party participations	1 million
Other contracts (rehab, special deals, etc.)	134 million

Granted, compared to FNMA's overall secondary market activities, these special efforts are minor. However, they are probably the only way FNMA can make an impact on low-income housing needs. Moreover, as Clemmer notes in his discussion of FNMA's support of the Section 235 and 236 programs, FNMA has provided significant financing for subsidized housing programs and has assisted them in gaining market acceptance. A similar effort is presently under way with regard to tax-exempt bonds. Given the shriveling up of housing subsidies for construction and rehabilitation, FNMA's numbers, though small in relation to its regular portfolio, could become bigger than HUD's.

Potential Activities

FNMA should increase its efforts to find ways in which the private sector can more actively participate in meeting the housing needs of low-income people. There are two major roles here, which FNMA is already playing: (1) set-asides or purchase commitments to support particular activities, such as the $25-million commitment to National Housing Services of America and (2) standardizing mortgage instruments and practices, as it has done with ARM's, for example.

Among the areas which should be explored, either by FNMA on its own or in partnership with other public or private organizations, are:

- Rehabilitation loans for elderly owners. More than half of all elderly owners have incomes below $10,000. Many of their homes need repairs or improvements, such as weatherization. Yet financing is typically both expensive and difficult to obtain.

- Shared equity for first-time home buyers. At least one jurisdiction (Dade County, Florida) has used shared equity as a means of making home purchase possible for households with incomes somewhat below 80% of median. Under the program, mortgage payments are reduced through an unamortized second mortgage, on which principal and accrued interest are repaid either upon sale of the unit or as income rises and/or the first mortgage is paid off.

- Assisting tenant purchase of units being converted to condominiums. Some jurisdictions, such as Washington, D.C., provide tenants with the right of first refusal. However, unless financing can be worked out, this right is meaningless. A FNMA program in this area might well prevent a substantial amount of displacement and anguish for low- and moderate-income tenants, particularly elderly tenants.

- Providing financing for limited-equity cooperatives, particularly those serving low- and moderate-income households. An increasing number of community-based housing organizations are turning to limited equity cooperatives as a way of coupling many of the benefits of home ownership with long-term housing affordability. Many conventional lenders, unfamiliar with this form of ownership, are reluctant to make loans. Yet the demand is there. For example, in 1984, the National Consumer Cooperative Bank contracted with the National Mutual Housing Network (a project of the Low Income Housing Information Service) and set aside $10 million for financing limited-equity low-income co-ops developed through the Network; a total of over $13 million in apparently qualified applications is now on hand.

- Reverse annuity mortgages and home equity conversion. These are approaches to enable elderly people to realize some of the value in their homes at a time when they need cash for other purposes. FNMA could play a major role, as it has with ARM's, in carefully designing and supporting approaches which enable elderly owners to benefit without exposing them to the risk of ending their lives with neither the home nor the cash they need.

- Rental housing. Although FNMA's charter emphasizes home ownership, FNMA financed an estimated 29,000 conventional multifamily units in 1984 and expects to triple this in 1985, provided there are not major changes in tax preferences currently granted to rental housing.

  FNMA should expand its efforts to finance multifamily housing, particularly in the face of the withdrawal of other federal subsidies. Annual Housing Survey data on new rental units for 1981 is analyzed in Table V. Median renter income in that year was $11,700. As the table shows, at 25% of income, only 12% of new rental units were affordable by renters with incomes below the median. However, more than three-quarters of the units could have been occupied by households with incomes below renter median at a cost-income ratio of 50%.

  There are several particular needs or opportunities which FNMA should examine with regard to rental housing: (1)

TABLE V. UNSUBSIDIZED NEW CONSTRUCTION UNITS, 1981: RENTS AND INCOME REQUIREMENTS

Gross rent	Units	Percent	Cum Percent	Income needed at 25%	30%	35%	50%
Total	5247	100.0%	100.0%				
Less than $8	18	0.3%	0.3%	$3,840	$3,200	$2,743	$1,920
$80-99	11	0.2%	0.6%	$4,752	$3,960	$3,394	$2,376
$100-124	22	0.4%	1.0%	$5,952	$4,960	$4,251	$2,976
$125-149	19	0.4%	1.3%	$7,152	$5,960	$5,109	$3,576
$150-174	48	0.9%	2.2%	$8,352	$6,960	$5,966	$4,176
$175-199	77	1.5%	3.7%	$9,552	$7,960	$6,823	$4,776
$200-224	148	2.8%	6.5%	$10,752	$8,960	$7,680	$5,376
$225-249	283	5.4%	11.9%	$11,952	$9,960	$8,537	$5,976
$250-274	393	7.5%	19.4%	$13,152	$10,960	$9,394	$6,576
$275-299	477	9.1%	28.5%	$14,352	$11,960	$10,251	$7,176
$300-324	549	10.5%	39.0%	$15,552	$12,960	$11,109	$7,776
$325-349	480	9.1%	48.1%	$16,752	$13,960	$11,966	$8,376
$350-374	449	8.6%	56.7%	$17,952	$14,960	$12,823	$8,976
$375-399	381	7.3%	63.9%	$19,152	$15,960	$13,680	$9,576
$400-449	594	11.3%	75.3%	$21,552	$17,960	$15,394	$10,776
$450-499	394	7.5%	82.8%	$23,952	$19,960	$17,109	$11,976
$500-549	264	5.0%	87.8%	$26,352	$21,960	$18,823	$13,176
$550-599	137	2.6%	90.4%	$28,752	$23,960	$20,537	$14,376
$600-699	169	3.2%	93.6%	$33,552	$27,960	$23,966	$16,776
$700-749	42	0.8%	94.4%	$35,952	$29,960	$25,680	$17,976
$750 or more	117	2.2%	96.7%	$0	$0	$0	$0
No cash rent	174	3.3%	100.0%				
Median	$351			$16,848	$14,040	$12,034	$8,424

the Graduated Payment Mortgage program for rental housing contained in the Housing and Community Development Amendments of 1983; (2) financing of resales of rental development--usually generated by tax considerations--in ways which would lead sellers and purchasers to structure them so as to continue to serve their present occupants (rather than "upgrading"); and (3) the role which FNMA should play in any transition of investment in rental housing as real shelter, rather than as tax shelter.

- Do no harm. Finally, FNMA should find ways to guard against inadvertently causing harm to low- and moderate-income people, primarily through displacement. Particularly in urban neighborhoods where gentrification is displacing low- and moderate-income people, FNMA should attempt to develop criteria for its portfolio and secondary market purchases which exclude properties where displacement is involved.

In each of the above areas, FNMA could play a significant role by working out standards for purchase of mortgages and/or making specific commitments. In some cases, developing pilot programs with state or local governments would make sense. In others, nongovernmental organizations, such as the National Mutual Housing Network, might well be involved. The approach should be to develop one or more pilot programs in each area and to move as rapidly as feasible to incorporating these activities into FNMA's regular portfolio activities.

In conclusion, the relevant policy question with regard to FNMA's activities in support of improved housing for low- and moderate-income people should not be "has it done enough?" but rather "what else can it do?"

Comment On Richard B. Clemmer, "Fannie Mae And Its Relationship To Low- And Moderate-Income Families"

Irving P. Margulies
Witkowski, Weiner, McCaffrey, and Brodsky, P.C.

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[GAO note: Mr. Margulies provided us with an edited transcript of his remarks in lieu of a separate paper. As shown in the remarks, we deleted several interjections by the moderator which did not affect the substance of Mr. Margulies' remarks.]

This has been an eye opener for me. I've been away from this scene for four years. My biography indicates that I've lately been General Counsel at Commerce and I'm now earning an honest living practicing law.

I should note that the firm I am with does work for FNMA on occasion, and I personally may do some work for FNMA. I say that, so you'll be aware of my interest.

* * *

I was thrilled to hear particularly Tim Howard's [Senior Vice President and Chief Economist, FNMA] flat concession that FNMA is subsidized. That was not as easily come by six years ago when HUD, who I then worked for, tried to get its hands around the value of the subsidy. We were not nearly as sophisticated at that time, as Ed Kane obviously now is, in defining this subsidy or measuring it.

In doing the regulations, we worked on the premise that, to some extent, FNMA enjoyed the benefit of public money. There was value in the agency rate and the reason that Congress had given FNMA the agency rate, was to achieve a public purpose, and part of that purpose involved more than simply the allocation, or the transfer, of certain amounts of money from one area to another and its use for housing. Something a little bit more than that; and that the Section 309 provision on housing for low and moderate income families should, in some way, be furthered.

We got nowhere. I must say that there was no support for it at all. The regulations were an absolute failure.

* * *

It took a very long time to write them, and the controversy they generated was far more intense than anything that was involved in the regulations. It was controversial because we were asserting that the sovereign had an interest in, and a right to allocate, the value of the subsidy.

And the corporation was of the view then, and it may be now, that the value of the subsidy is totally discharged either by carrying the loss in the portfolio, or by discharging the very narrow business that FNMA can engage in.

The point that Tim made earlier was that FNMA can't go out and buy Baa bonds. FNMA has a very limited business. And it discharges the value of whatever the sovereign gave it with the

agency rate when it conducts the business that the sovereign asks it to conduct.

I certainly don't want to go back to the debate.

The critical point was whether the sovereign, the Secretary of HUD and the Secretary of Treasury clearly have great power over FNMA, although that power has been eroded by legislative amendments that Congress has adopted over the last four years, could, at any time, assert the value of the subsidy and direct its use.

We found in 1978, when we wanted provisions that would force the measurement--perhaps force is too strong a word--provisions that would permit measurement of where the subsidy was going, a fire storm that to this day I find extremely hard to believe.

The mortgage bankers, the housing industry in total, feared, and I think now perhaps legitimately feared, that FNMA was an engine that was serving its one purpose. It was taking money out of the general economy and directing it to housing, and if you permitted the people that were running HUD to interfere with the running of FNMA they would simply screw up the working of the engine. HUD's concern was so specialized because of its concentration on central city problems, it could not be trusted to regulate FNMA.

Cushing [Dolbeare] now warns us that we ought not to have FNMA going into central cities because the credit it allocates would be used for gentrification purposes. Of course, when we did the regulations we wanted the investment in central city areas, and obviously it would have resulted in gentrification. The only people that could have carried the units that were financed would have been people that had money and not poor people, and the poor would have been displaced.

At any rate, I cite Cushing's point on gentrification to show you that when a public agency nudges FNMA to achieve social purposes it cuts a lot of ways. Perhaps had it been successful in 1978, HUD would have undercut the ability of FNMA to do the one thing that it does extremely well--take money away from the rest of the economy and shift it to housing.

I think that's probably all that FNMA can do effectively. The special programs that they run right now are really corporate giving in a sense. They're not important in a macho sense. They're programs that indicate social responsibility. They're not large in magnitude and they don't use much of the total amount of money that FNMA transfers to housing.

FNMA is a tremendous allocator of credit. FNMA is the second largest allocator of credit in the United States, next

only to the Treasury. It takes credit out of the general economy and allocates it to housing. If you are a houser, and I still am an unreconstructed houser, you rejoice at the idea that housing will be given a leg up by the transfer of this money.

If you are a houser with some kind of social agenda that's deeper than adding to the stock of housing which will benefit everyone, then you will be concerned that you squeeze the maximum value of the benefit of the Agency rate that you're giving to FNMA by directing where the funds for housing gathered by FNMA will go, i.e., in the central cities, or for housing for the poor, or whatever.

I have come to conclusions that government does not do that efficiently, and I would walk away from it entirely.

There are a couple of additional points that I would like to make. In response to the question, why we took two and a half times average income rather than some midpoint of housing cost as a criterion--that was a mistake. We took it only because we had no data on housing costs. I felt then, and I do now, that you ought not to relate the cost of housing and average income.

Which leads me to the response I had to Cushing's argument. You can't do anything about incomes except transfer money. We really won't be effective in the housing area until we sort out the two different things that we want to do.

There is housing and there is dollars. If we think people are poor, we can transfer dollars to them, and if we think that there is an inadequate stock of housing, we can advise programs that will add to the stock of housing.

* * *

We have believed for a very long time, many of us, that the key thing is to recognize that there are two distinct issues involved. You get in a lot of trouble when you confuse those two issues.

There are poor people that need money, and there are places where you have an inadequate housing stock. But a program that tries to add to the housing stock by allocating units to poor people, is doomed to disaster always.

I'll stop on that point.

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FNMA's Views On The Symposium

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April 10, 1985

FannieMae

Mr. William Gainer
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Dear Bill·

We at Fannie Mae want to thank both you and Tony Downs for providing us with the opportunity and time to present our views at the GAO's February 7, 1985 symposium.

The papers of Professors Clarke and Vandell lend substantial support to our business strategy. And Professor Clemmer's work recognizes the special service Fannie Mae has provided low- and moderate-income home buyers. Therefore, this comment supplements and highlights the conclusions of three of the four conference papers. We address Professor Kaufman's analysis of Fannie Mae's countercyclical role in more detail and respond briefly to Professor Kane's comments about management's interest in risk reduction.

Before turning to the specific papers, however, we offer an integrating concept for analyses of Fannie Mae, including these papers. Discussions of Fannie Mae often have a disjointed character. Some commentators focus on the company's private, profit-making nature; they see what they term "subsidies," without recognizing that Fannie Mae's shareholders have traded substantial business freedom in exchange for these benefits. Alternatively, other analysts focus on Fannie Mae's public purposes, with only passing attention to the fundamental fact that Congress chartered Fannie Mae as a private, shareholder-owned corporation and that it must operate like one.

These two visions of Fannie Mae need not conflict. Most corporations are chartered by states under the assumption that they employ private capital to produce goods and services that benefit the public. In varying degrees, these other corporations are regulated by (and frequently benefit from) federal, state, and local authorities.

Fannie Mae takes the corporate charter concept one step further. The Congress granted Fannie Mae a limited business charter -- restricting it to one line of business and further confining it in a number of specific respects. This limited grant to do business harnesses private capital, management, and the profit motive to serve only the secondary market for home mortgages. Moreover, Congress envisioned that Fannie Mae, as an ongoing corporation, could and should adapt its products and services to changes in the housing finance market.

To attract private capital and management to this restricted task, Congress elected to exchange certain benefits. The terms of this compact, Fannie Mae's statutory corporate charter, basically enable Fannie Mae to borrow more money less expensively than other companies. The terms also motivate Fannie Mae to pass this benefit on to the primary lending market and to home buyers. And this is precisely what Fannie Mae does.

Viewed in this context, Fannie Mae looks more like other companies. Many other financial corporations also have Federal charters, receive some advantageous treatment, and serve limited purposes -- although the restrictions on most have lessened recently. Indeed, even the implied Federal backing of Fannie Mae's debt appears less noteworthy in light of the government's avowal that it will not let the nation's largest banks go under.

The point of this perspective is that for purposes of policy evaluation, Fannie Mae cannot be viewed in isolation. The benefits it receives need to be compared with the treatment of similarly situated companies and related to the business freedom given up by its shareholders. The services Fannie Mae offers should be examined in the context of a private company competing in a dynamic market.

Professor Clarke's paper analyzes Fannie Mae as a business that has had to adjust to drastically changed market conditions. Indeed, he concentrates on the key aspect of Fannie Mae's business: the strategy to reduce the company's interest rate sensitivity.

We believe Professor Clarke's work is fundamentally sound. He captured succinctly the balance that must be struck in reducing Fannie Mae's interest rate risk: "[I]t is often very difficult to restructure in a period of poor earnings, because rates are usually relatively high when

earnings are poor, and therefore restructuring can be costly, compounding the earnings problems."

Other analysts ignore this critical point -- that the company must spend (or forego) revenues to reduce risk. Too deep of a cut in revenues, especially if it results in substantial losses, can actually worsen the company's risk position by eroding its capital base and leading investors to demand higher yields on the billions of dollars of debt Fannie Mae issues.

Fannie Mae's strategy, as Dr. Clarke appreciates, is to nurture numerous sources of earnings to (1) offset the negative interest margin on the old portfolio, and (2) more closely match the durations of its new assets and liabilities. The corporation's enhanced earnings come largely from charging appropriate fees for its commitments to purchase mortgages and the annuity-like stream of income from the MBS program we started in 1981. Underlying this sweeping categorization of earnings sources, however, are numerous products and services that Fannie Mae has developed recently to satisfy market demands.

Fannie Mae has "spent" these revenues to reduce risk in two ways. First, we have purchased adjustable rate mortgages (ARMs), which yield less than new fixed-rate loans but will maintain a positive return if rates rise. Second, we have paid investors higher yields to extend the maturity of our debt. These risk reduction efforts cannot and should not ignore market conditions: The corporation does not want to lock in payments on long-term debt when rates are high, and it must sift carefully through myriad ARM proposals to acquire safely designed and underwritten investments.

Fannie Mae's actions demonstrate management's commitment to reduce the company's future sensitivity to interest rates while coping with the prodigious losses embedded in today's portfolio. In the last three years, we have successfully cut years off the duration gap between new assets and liabilities. ARMs and shorter-term second mortgages now comprise 17 percent of our portfolio. Our total MBS outstanding is nearing $40 billion. And we are continuing to develop new sources of fee income.

Professor Clarke clearly acknowledged these accomplishments. He concluded that "[t]he record shows that over the last three years Fannie Mae has made an effort to restructure [its] balance sheet, and it is important that this effort continues."

Professor Vandell's review of the credit risk associated with Fannie Mae's purchases of ARMs isolates and tests one important aspect of the company's business strategy. Professor Vandell's major finding, like Dr. Clarke's, endorses our action: "[The simulation] results suggest that the increased yield flexibility of the ARM design in most circumstances resulted in increased yields which more than offset the losses caused by increased default risk."

Dr. Vandell also concluded that Fannie Mae's ARM purchases have not been responsible for the company's increased foreclosure losses. Nevertheless, Dr. Vandell warned that steeply rising interest rates could trigger higher defaults among ARMs. We have recognized this risk and have acted to limit it.

From the start, Fannie Mae has sought the proper balance among reducing default risk, making home financing affordable, and offering home buyers a variety of ARMs that suit particular needs. We led the introduction of rate-capped ARMs, an important consumer protection feature. And early last year we substantially adjusted our ARM underwriting requirements. Indeed, our major targets for restrictions were the graduated-payment option and first-year discounts, the two features that Professor Vandell found most worrisome. We expect additional fine tuning of the balance between affordable financing and credit risk as we learn more; to move too hastily in one direction could result in harm to both home buyers and Fannie Mae.

Professor Clemmer's paper on Fannie Mae's efforts to serve low- and moderate-income families shifts the discussion from Fannie Mae's business strategy to one significant service Fannie Mae furnishes. We obviously are pleased that Dr. Clemmer found that "[i]f we accept a definition of 'moderate-income housing' that includes homes near the national median sales price and below, then Fannie Mae devotes a major part of its mortgage purchases to such housing."

Other conference participants pointed out that data limitations make it difficult to gauge Fannie Mae's exact contribution. Therefore, it is important to underscore that Professor Clemmer resolved this uncertainty as follows: "It is doubtless true, but difficult to quantify, that effects of Fannie Mae's commitments and mortgage purchase activities have been beneficial to homeowners, including those of lower incomes."

Finally, we believe the contrasting approaches of Dr. Clemmer's discussants, Irving Margulies and Cushing Dolbeare, are both worth noting. Mr. Margulies, who had helped draft the HUD regulations that had directed a portion of Fannie Mae's investment to targeted social purposes, admitted that the regulations had been a failure. In essence, Mr. Margulies concluded that the government's compact with Fannie Mae calls for the corporation to channel credit efficiently to housing; the statutory limits on the dollar size of Fannie Mae's purchases then restrict its activity to low-, moderate-, and middle-income families. The compact does not envision regulatory directives that dictate how Fannie Mae is to allocate its private sector borrowings.

Ms. Dolbeare, on the other hand, is motivated by the enormous housing needs of the poor. While she would like Fannie Mae to lend more help to the poor, Ms. Dolbeare recognizes that the corporation cannot do much without government subsidies for low-income families. But she argues that Fannie Mae's special and demonstration projects for low-income families warrant more attention than they often receive from analysts reviewing aggregate data. As Ms. Dolbeare stated, "given the shrinking up of housing subsidies...Fannie Mae's [special project] numbers, though small in relation to its regular portfolio, could become bigger than HUD's."

The fourth paper, by Professor Kaufman, tests the continuing effect of another service Fannie Mae has supplied: counter-cyclical support. We believe that the flaws in Professor Kaufman's econometric analysis, most of which were identified by other discussants, severely undercut his conclusion that "Fannie Mae did not appear to have significant counter-cyclical impact during the most recent [1980-84] cycle."

First, Professor Kaufman employed a reduced form, linear specification that is not detailed enough to capture as complex a phenomenon as the determination of housing starts. It is logical to expect that Fannie Mae's activity will affect mortgage originations (for new and existing houses) or home sales more directly than housing starts. Increased mortgage originations and house sales will certainly lead to more housing starts, but they will do so through a more complex chain of causation than Dr. Kaufman's simplified model will capture.

Second, Professor Kaufman's equation excluded a number of important independent variables. In particular, the equation failed to include any proxies for the period's

high real interest rates and home price disinflation, both of which lowered housing starts. By excluding variables that would have depressed housing starts, the equation may transfer their negative effects to Fannie Mae's commitments to purchase mortgages, biasing the effect of our commitments downward.

Dr. Kaufman also failed to include variables that might capture: (a) demographic changes; (b) the complex stock-adjustment process in housing demand (i.e., pent-up demand or the converse); (c) the effect of ARMs; and (d) the effect of Federal Home Loan Bank Board advances. He also mixed nominal and real (i.e., inflation-adjusted) variables.

These econometric criticisms tally with the remarks of Professor Von Furstenberg, a discussant who acknowledged that, while he shared Dr. Kaufman's prediliction, he did not find Dr. Kaufman's econometric results technically persuasive.

Regardless of the weaknesses of this particular model, we believe that any econometric analysis of Fannie Mae's countercyclical role is probably incomplete: Some of Fannie Mae's more important contributions to the stabilization of the housing finance system simply may not lend themselves to quantification. Two important examples of this are: (1) Fannie Mae's role in speeding the industry-wide acceptance and popularity of ARMs, which unquestionably fueled the housing recovery in 1984; and (2) Fannie Mae's willingness to purchase large amounts of "non-standard" products that helped borrowers afford homes. This latter contribution of increased liquidity results in more of such mortgages because lenders know there is a ready market-rate outlet for them. No equation, no matter how well specified, will pick up these effects.

In conclusion, we believe the difficulties of Dr. Kaufman's analysis led him far afield from a simpler and more straightforward quantification of Fannie Mae's countercyclical role. Since market share data became available in 1957, Fannie Mae has always increased its share of the secondary mortgage market during the low point of each housing cycle. Thus, the corporation has enhanced market liquidity and increased the flow of capital to housing when it was needed most. When housing resumes a normal level of activity, Fannie Mae's market share drops dramatically. Any fair analysis of Fannie Mae's countercyclical role must address this data.

Professor Kane did not present a paper. However, one of his claims -- that management's interest lies in increasing the company's risk -- is so serious as to require a rejoinder.

First, management has a strong personal incentive to avoid the professional and financial disaster of Fannie Mae's failure. Every tenet of organizational theory contrasts markedly with Professor Kane's blithe assumption about management's aims.

Second, any Federal intervention to prop up Fannie Mae would certainly cost the shareholders (including management) their equity investment.

Third, Fannie Mae's management recognizes that its charter grants it a "franchise" that should have long-run economic value to its shareholders; management would not want to jeopardize that future earning power in a quest for short-run profits.

Fourth, management's actions from 1981 to 1985 evidence a strong interest in reducing the corporation's sensitivity to rate changes. The papers of Professors Clarke and Vandell testify to the company's commitment to this risk reduction strategy even during a period of historically high rates and significant losses.

Let me close by offering a final perspective on the symposium. The papers of Professors Clarke and Vandell offered a good foundation for discussing Fannie Mae's business strategy. But the work of Professors Clemmer and Kaufman focused the conference discussion on just two of the services Fannie Mae makes available in the housing finance market. The company offers numerous other, equally important, services.

One of the strengths of Fannie Mae's profit-making corporate form is that it enables, even requires, the company to adapt to market needs. Within the confines of its charter, Fannie Mae has vigorously changed its business services in the 1980's. Fannie Mae's development of ARMs, which Professor Vandell analyzed in terms of credit risk, offers just one example of a recent Fannie Mae effort to make housing more affordable. Similarly, Fannie Mae's entry into the markets for conventional multifamily mortgages, co-op loans, and second mortgages has promoted new market opportunities and pricing efficiencies. On the other side of the balance sheet, Fannie Mae has tailored financing tools to broaden the base of investors (both domestic and international) in housing.

The full list of services that Fannie Mae furnishes is too extensive to discuss here. We urge, however, that any policy analysis of the compact between Congress and Fannie Mae's shareholders take care to review the range of services the corporation supplies.

Overall, we believe the conference was successful; we congratulate you on your productive effort in arranging this symposium in such short time. As we discussed, we would appreciate your inclusion of this letter in your publication of the symposium papers.

Sincerely,

DPR/sb

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